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Original Communications

INFECTED ENDOMETRIAL CYSTS OF THE OVARIES

A REPORT OF THREE CASES, TWO OF WHICH WERE BILATERAL

BY JOHN A. SAMPSON, M.D., ALBANY, N. Y.

(From the Gynecologic and Pathologic Departments of the Albany Hospital and the Albany Medical College)

THE complications of ovarian cysts form one of the most interesting chapters in gynecology. The accidents occurring to these tumors and the secondary changes in them furnish an important group in these complications.

Torsion of the pedicle of an ovarian cyst is a well recognized clinical entity. Hemorrhage into their cavities, independent of torsion of the pedicle, often occurs in small amounts and occasionally is so great, in large cysts, as to give rise to the symptoms of a severe internal hemorrhage. Perforation and rupture of these cysts are other well recognized complications. The results of the escape of their contents into the peritoneal cavity depend upon the nature and the amount of material reaching that cavity. If the epithelium lining the cyst is one which may be implanted on the peritoneum, such implantations may occur in places soiled by the contents of the cyst. Malignant changes in the epithelial lining of benign cysts have been fully appreciated by those interested in the study of these tumors.

A review of the literature of infected ovarian cysts leads me to believe that this complication has not received the attention which it deserves. Wiener,[1] in the study of 240 consecutive patients with ovarian tumors operated upon in Mount Sinai Hospital (New York City), found that torsion of the pedicle had occurred in 12.26 per cent and infection in 2.23 per cent of these cases. While the incidence of infec-

tion was not so great as that of torsion of the pedicle, it is of even greater clinical importance and scientific interest. Many organisms have been found in infected ovarian cysts, such as streptococci, staphylococci, gonococci, pneumococci, tubercle bacilli, colon bacilli, typhoid bacilli, and paratyphoid bacilli, as well as various unidentified bacteria.

The primary source of the infection and the routes by which bacteria may reach these cysts have rightly been of great interest.

The contents of a cyst may become infected as a result of tapping it through the abdominal wall or incising it through the vaginal vault. Tapping, which many years ago was a common procedure, often led to infection of the contents of the cyst, but in recent years very few cases of infection from this source have been reported.

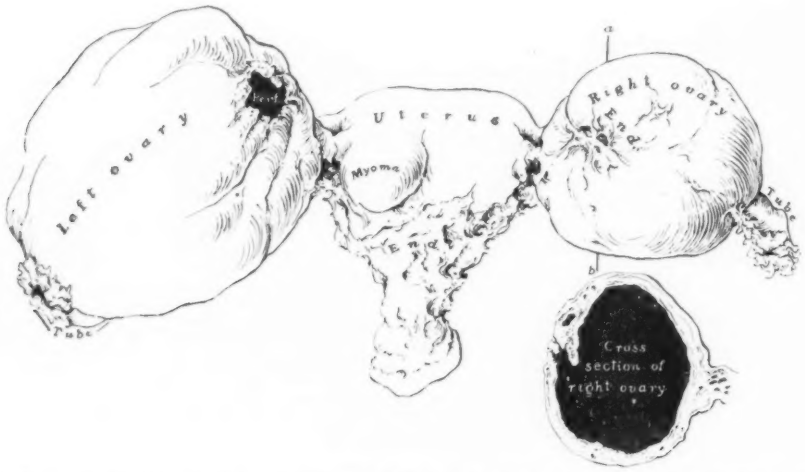

Fig. 1.—Posterior view (x ½) of the uterus and both tubes and ovaries (Case 1). Infected endometrial cysts of both ovaries (gram-negative bacillus of paratyphoid group), associated with peritoneal endometriosis and leiomyoma of the uterus. The left ovarian cyst (partially collapsed) was adherent by its under surface to the posterior uterine wall. In separating the two, the wall of the cyst was torn and its purulent contents escaped. The unruptured right ovary (6 cm. in its greatest diameter) is turned upwards, exposing its lateral surface which was adherent to the posterior surface of the broad ligament. Endometriosis is present on *this* surface of the ovary. The difference in size of the two ovarian cysts suggests that the larger one is the older. Both *tubes* were *patent* and *normal*. The only evidence of infection found was that present in the ovarian cysts.

The fallopian tubes have naturally been described by many writers as one source of infection of the contents of ovarian cysts. A tubo-ovarian abscess is a not infrequent complication of gonorrheal salpingitis. One can readily understand the origin of such a condition from the direct extension of the infection through the patent abdominal ostium of the tube into an adjacent ruptured follicle with a resulting inflammatory reaction. The gonococcus, the most frequent cause of salpingitis, has rarely been obtained from the contents of true ovarian cysts. I have found only one case in the literature. In 1908 Brettauer[2] reported a gonorrheal infection of a large ovarian cyst

which filled the pelvis and extended into the abdomen to the level of the umbilicus. The contents of the cyst consisted of turbid seropurulent fluid. Gonococci were found in the cyst contents, the distal end of the acutely inflamed tube and in the uterine cavity.

Moench[3] has made a careful study of tuberculosis of ovarian cysts and in 1923 gave an excellent presentation of his own work, as well as a review of the literature up to that date. From the literature and his own personal observations he collected thirty cases of proved tuberculous ovarian neoplasms. He believes ovarian cysts may become infected with tubercle bacilli from the blood stream, by direct contact or lymph stream infection, tapping an ovarian cyst in the presence of tuberculous peritonitis and from the spontaneous rupture of a

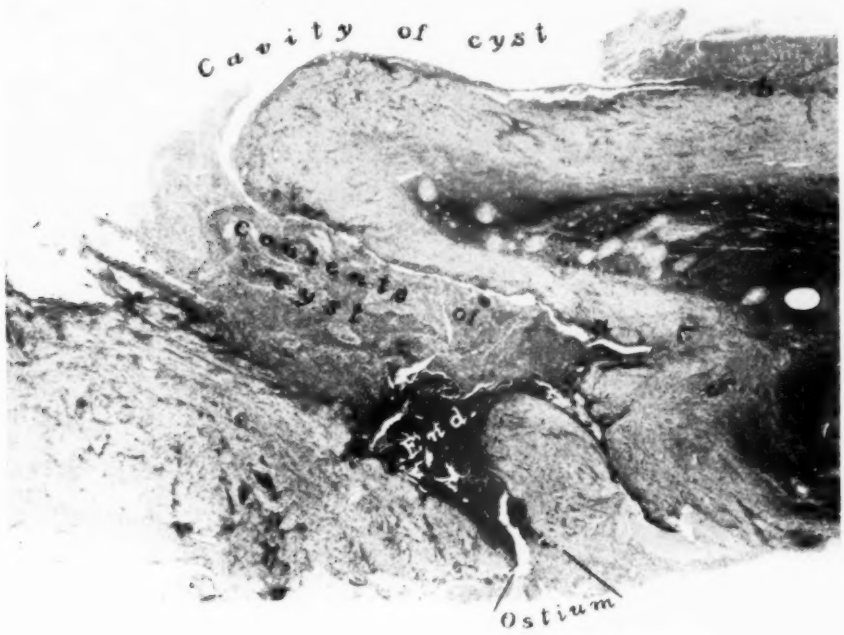

Fig. 2.—Photomicrograph (x 10) of a section of the lateral wall of the right ovarian cyst (or hematoma) indicated in Fig. 1. The surface of this portion of the ovary was adherent to the posterior layer of the broad ligament. The most striking feature is an apparent ostium in the wall of the cyst which is filled with typical endometrial tissue (End.) This represents either the route taken by endometrial tissue invading the ovary from its peritoneal surface or else a perforation which has been "plugged" by endometrial tissue growing out from the lining of the cyst. A purulent exudate is present on the surface of the ovary about this area. Other sections showed that this exudate arose from infection escaping through the ostium. In places the purulent contents of the cyst are adherent to its lining. In other situations they were lost in the fixation of the specimen. See also Figs. 3 and 4 taken at *a* and *b*.

tuberculous process into the cavity of an ovarian cyst. In two of three cases reported by him, in which the wall of the cyst was tuberculous, the tubes were also tuberculous. He concludes that it is possible that the ovarian tissue, in these two cases, might have become infected from the tubes through the lymphatics. In 1927 Cartier and Santuejoul[4] reported a large ovarian cyst, with ten liters of fluid, removed from a pregnant woman. Smears from this fluid showed tubercle bacilli,

and a guinea pig, inoculated with it, developed tuberculosis. The cyst was the only evidence of tuberculosis found in the patient. Björkenheim[5] recently reported a case of tuberculosis of an ovarian cyst associated with tuberculosis of the tubes. He concludes that the cyst became infected either by way of the tubal lymphatics or through the blood stream from the lungs.

While tuberculosis of an ovarian cyst may sometimes be secondary to that of the tubes, probably both often have a common origin and the blood stream possibly plays an important rôle in carrying tubercle bacilli to the tubes and the cyst.

In puerperal infection, the organisms (the gonococcus excepted) usually extend beyond the uterus by way of the lymphatics and veins;

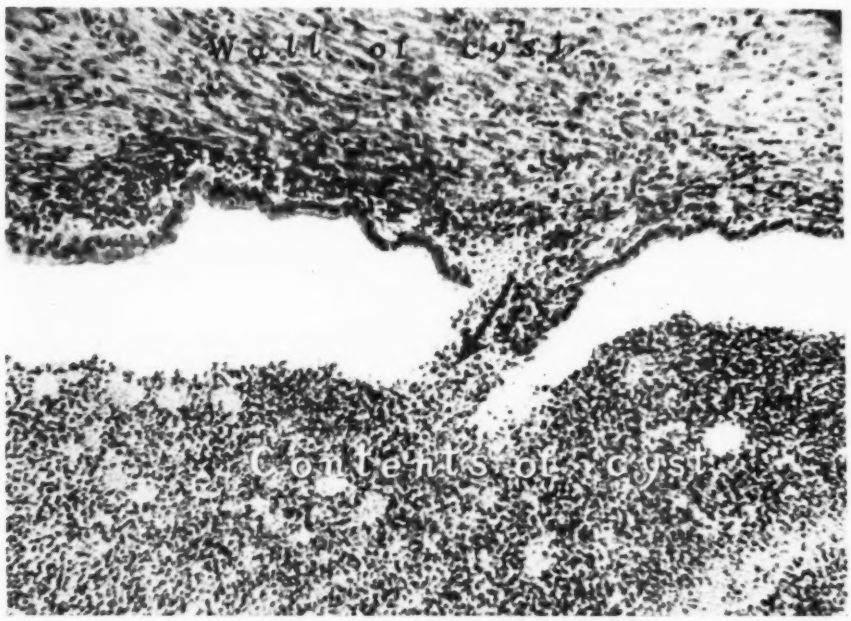

Fig. 3.—Photomicrograph (x 130) of the portion of the wall of the cyst and its contents, indicated by *a* of Fig. 2. The epithelial lining of the cyst is well shown and also the inflammatory reaction in its wall. There is a break in the epithelial lining through which a purulent exudate is escaping (see arrow) from the wall of the cyst into its cavity. The purulent contents of the cyst have retracted from its lining (due to fixation) except at the site of the above-mentioned "break." Through such breaks as this bacteria might be carried into the cavity of the cyst.

and rarely through the lumen of the tube. Puerperal salpingitis, other than gonorrheal, seldom occurs.

An ovarian cyst may become infected during the course of puerperal infection just as the normal ovary becomes infected, namely, from bacteria in the circulating blood, through the venous circulation of the ovary after the formation of a thrombophlebitis (a retrograde infection as stated by Peterson[6]), by way of the lymphatics and probably less frequently through the lumen of the tube and from a peritonitis.

For anatomic reasons we have been tempted to consider the tubes a

frequent source of the infection of ovarian cysts. I believe that their importance has been overestimated.

It is conceivable that bacteria may occasionally reach the contents of an ovarian cyst, especially a thin-walled one, from any peritoneal infection, irrespective of its source, which involves the wall of the cyst. Appendicitis, sigmoiditis, diverticulitis, intestinal tuberculosis, and carcinoma might cause the infection of an ovarian cyst which became adherent to the diseased portion of the intestine with or without the formation of a fistulous communication between the lumen of the in-

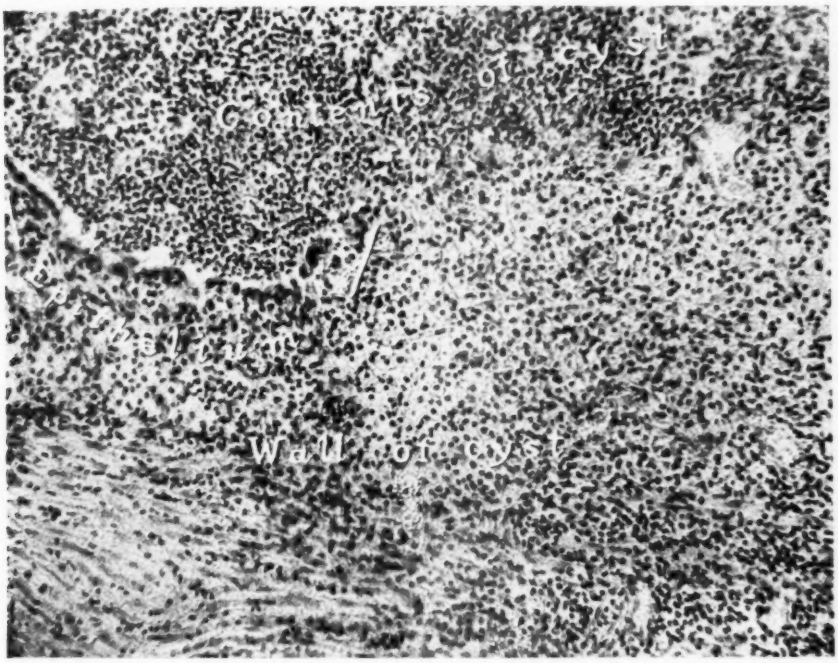

Fig. 4.—Photomicrograph (x 130) of the portion of the cyst wall and its contents indicated by *b* of Fig. 2. The epithelial lining of the cyst is intact in the left third of the photomicrograph. To the right it is absent. This portion of the cyst is lined by granulation tissue with a marked inflammatory reaction and indicates that the purulent contents of the cyst came from this source. Through such an area bacteria might readily escape into the contents of the cyst. Histologically, the left ovarian cyst was similar to this one and both apparently showed the same stage in their inflammatory reactions, thus indicating that both cysts might have become infected at the same time. Cultures from both cysts showed the same organism and bacilli (Goodpasture's stain) were found in the superficial portions of the lining of both cysts as well as in their contents.

testine and the cavity of the cyst. The fact that the infected ovarian cyst is adherent to some portion of the intestinal tract does not prove that the cyst became infected from this source.

The importance of the blood stream as an avenue by which bacteria may gain access to ovarian cysts has been emphasized by the relatively large number of these cysts infected by the typhoid bacillus, as well as from a more careful study of cysts infected with other organ-

isms. Wiener mentions in his article (published in 1915) that up to that time twenty instances of typhoid infection of ovarian cysts had been published. In a later article[7] he states that "the frequency and importance of hematogenous infection of the ovary has not received due attention and emphasis." In 1923 Corscaden[8] reported a case of paratyphoid infection of an ovarian cyst and in 1926 Cordua and Keek[9] reported a similar one.

We know that bacteria frequently gain access to the circulating blood from many sources and therefore might sometimes escape into the contents of an ovarian cyst. I believe that future studies will show that the blood stream is the principal avenue by which ovarian cysts become infected.

Fig. 5.—Photomicrograph (x 25) of a portion of the posterior uterine wall (Fig. 1), showing endometrial tissue on and also apparently invading the uterus from its peritoneal surface. There is a localized thickening of the tissues of the uterine wall toward this invasion. The endometriosis of the ovaries (Fig. 2) and the peritoneal endometriosis, shown here, suggest that either they had a common origin or one was derived from the other. The patent tubes and ovarian hematomas with evidence of dissemination of the contents of the latter indicate two sources from which müllerian epithelium might have reached this situation.

A comparative study of the complications of endometrial cysts or hematomas of the ovary and those of other cysts of that organ shows that the former are subject to all of the complications of the latter with one possible exception. Torsion of the pedicle of an endometrial cyst probably rarely, if ever, occurs, because these cysts are usually very adherent by their under or lateral surfaces to adjacent pelvic structures.

Hemorrhage into their cavities is one of the characteristic features of these cysts. Perforation and rupture of their wall apparently often occurs and some of their contents escape into the peritoneal cavity. Circumstantial evidence indicates that peritoneal endometriosis, at times, arises from the implantation of bits of the epithelial lining of

the cyst carried with the contents through the perforation or rupture. The epithelial lining of these cysts occasionally undergoes malignant changes.[10]

During the last five years endometrial tissue was encountered in one or both ovaries of 101 patients admitted to the gynecologic service of the Albany Hospital. In forty of these an endometrial cyst or hematoma (over 2.5 cm. in diameter) was found in one or both ovaries. In three of these forty cases the endometrial cysts were infected, namely, 7.5 per cent, as compared with 2.23 per cent of infected ovarian tumors in a series of 240 cases reported by Wiener. In two of our three cases infected endometrial cysts were present in both ovaries, thus making in all, five infected endometrial cysts.

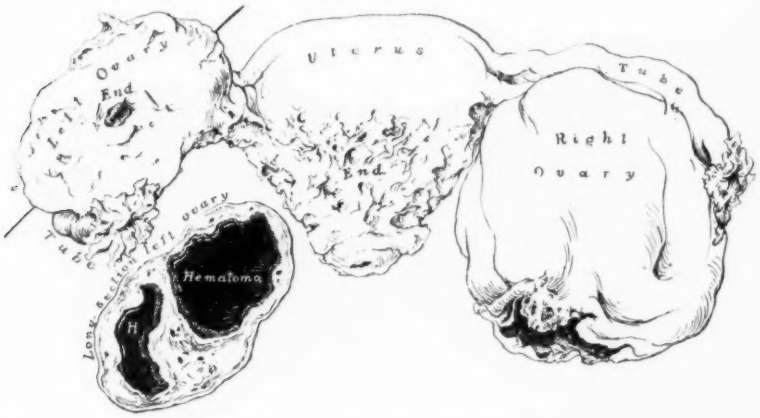

Fig. 6.—Posterior view (x ½) of the uterus and both tubes and ovaries (Case 2). Infected endometrial cysts of both ovaries (gram-positive micrococcus) associated with peritoneal endometriosis. The right ovarian cyst (collapsed) was adherent to the posterior surface of the uterus and the bottom of the culdesac, the latter due to a previous vaginal puncture. Prior to the vaginal puncture the cyst filled the pelvis and extended into the abdominal cavity to the level of the umbilicus. The unruptured left ovary (7 cm. in its greatest diameter) is turned upward, thus exposing its lateral surface which was adherent to the posterior layer of the broad ligament and the side of the pelvis. Endometriosis is present on *this* surface of the ovary. The endometrial hematoma appears as two loculi in the longitudinal section of the ovary. Both *tubes* were *patent* and *normal*. The only evidence of infection found was that present in the ovarian cysts. Compare with Fig. 1 and note the great similarity in the conditions found in the two cases.

Wunderli[11] has emphasized the importance of torsion of the pedicle of a cyst as a predisposing factor in the infection of its contents. The extravasated blood in the cavities of cysts with twisted pedicles furnish excellent culture media for bacteria from any source. Endometrial hematomas, with their bloody contents, also might afford equally rich media with the advantage that their nutrient arteries would be freer to transplant bacteria to the cyst. The trauma associated with their reaction to menstruation and the absence of an epithelial lining which often exists in parts of the cyst would favor the passage of bacteria into their cavities. The perforation of an endometrial cyst in

the presence of pelvic infection from any source might lead to the infection of its contents. These facts, together with our experience in the study of endometrial cysts, suggest that these cysts or hematomas may readily become infected.

On account of the importance of a greater appreciation of infected ovarian cysts and especially of endometrial ones, a report of these three cases follows.

REPORT OF CASES

In order to better understand the conditions present in these three cases, the first one encountered is reported last.

CASE 1.—*Infected endometrial cysts of both ovaries (due to a gram-negative bacillus of the paratyphoid group).*

The patient, single, aged thirty-six years, complained of a tender tumor in the lower left abdomen. Menstruation had been regular, normal and without pain.

Fig. 7.—Photomicrograph (x 25) of a portion of the lateral wall of the right ovarian cyst (Fig. 6) showing typical endometrial tissue lining a crevice and also some of the purulent contents of the cyst in the lumen of the crevice. Compare with Fig. 2. The cyst about the opening of this crevice is lined by granulation tissue.

She had a "grippy" cold, followed by a cough, which began just before Christmas of 1924 and had persisted until shortly before coming to the Albany Hospital on April 13, 1925. Her admission temperature was 100.4° and pulse 100. On physical examination the patient did not seem ill. Her heart and lungs were apparently normal. Believing that the elevation of temperature might be due to some pulmonary lesion which had been overlooked, a radiogram of the chest was made. This was negative. The urine showed a trace of albumin and a few leucocytes, but was otherwise normal. The patient stated that the tumor was first noticed two weeks before her admission. Pelvic examination showed that the uterus was pushed forward by a cystic tumor filling the posterior culdesac and extending well above the pelvic brim, so that it could be easily palpated through the abdominal

wall to the left of the median line. A preoperative diagnosis was made of an ovarian cyst. On account of its large size, the true condition was not considered, but should have been. The temperature and pulse became normal the day after her admission and remained so.

At operation, April 16, a cyst (about 12 cm. in diameter) arising from the left ovary was found. This cyst was fused with the posterior surface of the uterus. The appendix was first removed. In attempting to free the ovarian cyst, its walls were torn and a large amount of "chocolate" fluid mixed with "pus" escaped. The enlarged right ovary was adherent by its lateral surface to the posterior layer of the broad ligament. The ovary was carefully freed without rupturing it. Both tubes, ovaries and the entire uterus was removed (Fig. 1). The pelvis was drained with gauze through the vagina. An extensive peritoneal endometriosis

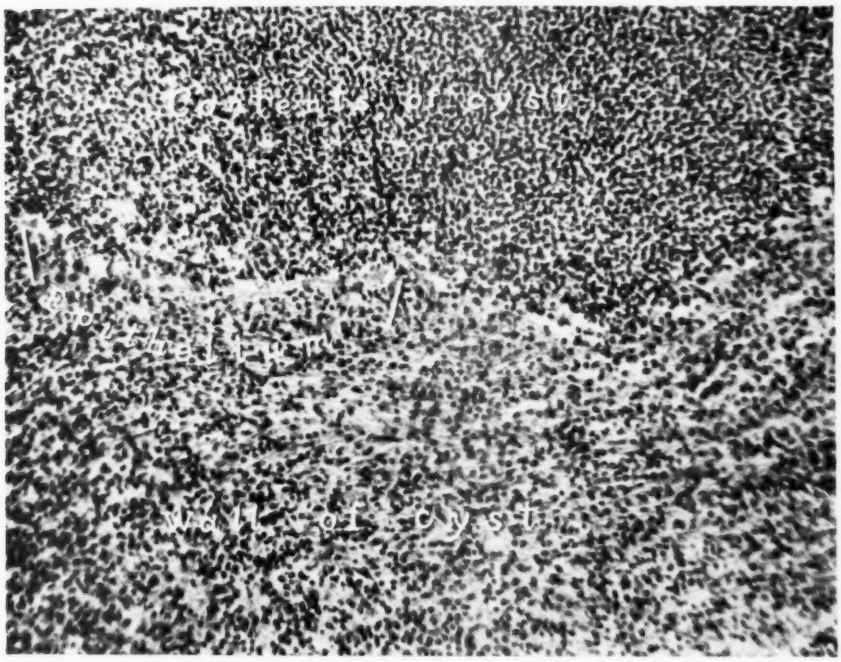

Fig. 8.—Photomicrograph (x 130) of a portion of the wall and purulent contents of the infected endometrial cyst of the left ovary shown in Fig. 6. Compare with Fig. 4. The two photomicrographs are nearly identical. The attenuated epithelial lining can just be made out in the left half of the photomicrograph. To the right it is absent. The wall of the cyst is infiltrated with leucocytes. The purulent contents of the cyst came from this source. Histologically, the lining of the cyst in the left and right ovaries was similar. Cultures from both cysts were sterile, but a gram-positive micrococcus occurring singly, in pairs and in short chains was found in the contents of both cysts, in the superficial portion of their lining and wherever a purulent exudate was present. See Fig. 10.

was found involving the posterior surface of the uterus and the sigmoid. Scattered small "implantations" were present in the anterior culdesac. The patient made an uneventful convalescence.

The histologic structure of the two cysts was similar. Typical endometrial tissue was found only in a few places and that in the walls of the cysts which had been adherent to the surface of the uterus (left) and the posterior surface of the broad ligament (right). (Fig. 2.) The greater portion of both cysts were lined by granulation tissue. The remainder of the cysts were lined by cuboidal or

columnar epithelium. A marked inflammatory reaction was present in the walls of both cysts and especially in the positions lacking an epithelial lining (Figs. 3 and 4). This reaction apparently represented the same stage in both cysts, thus suggesting that they had become infected at the same time. Bacilli (Goodpasture's stain) were found in the superficial portions of the lining of both cysts. The contents of both cysts were purulent and the leucocytes escaped into their cavities through "breaks" in their epithelial lining and from the portions of the cysts lined by granulation tissue. The tubes were patent and normal. The uterine mucosa was normal. The cysts were the only infected foci found in the pelvis.

Smears from the contents of both cysts showed a few gram-negative bacilli. Cultures from both cysts and the urine showed the same organism, namely, a gram-negative bacillus which had some of the cultural characteristics of the paratyphoid group, but did not agglutinate in immune serum. Miss Louise N. Batt, who made a very careful study of the organism at that time, and was unable to identify it, now believes that it was probably paratyphoid C. Judging from the data, given above, these cysts were infected by bacteria carried in the blood. The primary source of the infection was not determined. The "grippy" cold with a cough

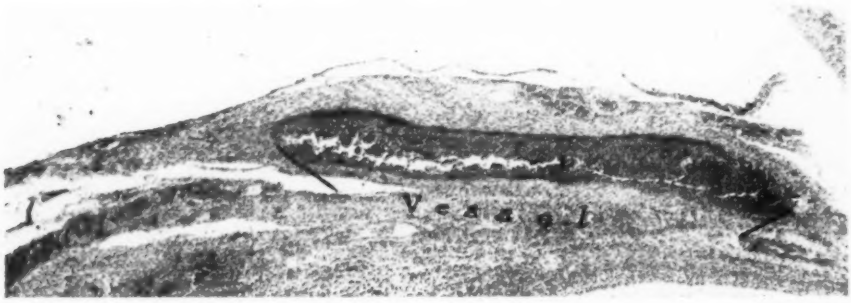

Fig. 9.—Photomicrograph (x 25) of a portion of the left ovary (Fig. 6) showing a thrombosed vessel. The situation, in size and walls of this vessel correspond with those of veins present in noninfected ovaries. It is filled with leucocytes and unidentified cells. For a high magnification showing bacteria, see Fig. 10.

which the patient had prior to her admission could easily have lowered her resistance, but would hardly give rise to a bacteremia due to a bacillus of the paratyphoid group.

CASE 2.—*Infected endometrial cysts of both ovaries (due to a gram-positive micrococcus).*

The patient, single, aged thirty-two years, was admitted to the medical service of Dr. Thomas Ordway at the Albany Hospital on September 1, 1927. Menstruation had been regular, normal and without great discomfort. She had influenza in 1918, was ill for two weeks, but had no complications. The onset of her present illness, of a month's duration, was with feeling tired, loss in appetite and aching all over. She consulted a physician who found her with a temperature of 103°. For the first week of her illness there were no other symptoms than those already mentioned. Her temperature varied from day to day, the highest being 103.5°. At the end of a week she began to have abdominal pain, most noticeable with bowel movements. A tumor was first detected in the lower right abdomen two weeks before her admission. This was diagnosed a myoma of the uterus. At no time did she have a cough or any other symptoms referable to the respiratory tract.

The heart and lungs were apparently normal. While under observation on Dr. Ordway's service, her temperature ranged from 102° to 104° and the pulse from 120 to 130. Hemoglobin was 75 per cent; red blood cells, 4,860,000, and leucocytes 4,350 to 5,350 (counts on two different days). Urine was normal. Urine and blood cultures showed no growth. Widal and agglutination to paratyphoid A and B were negative.

She was examined by Dr. Lyle A. Sutton on September 4. He found a large pelvic tumor filling the posterior culdesac and extending into the abdomen to the level of the umbilicus. He made a diagnosis of an infected ovarian cyst and advised a vaginal puncture. This was done by him September 7. A large amount of purulent bloody fluid escaped. Smears from this fluid failed to show any bacteria and cultures showed no growth. The patient felt greatly relieved. The temperature gradually fell to normal for the greater part of each day with a slight rise in the afternoon. Her highest temperature the day before her discharge was 99.2° and her pulse was 120. She left the hospital on September 18.

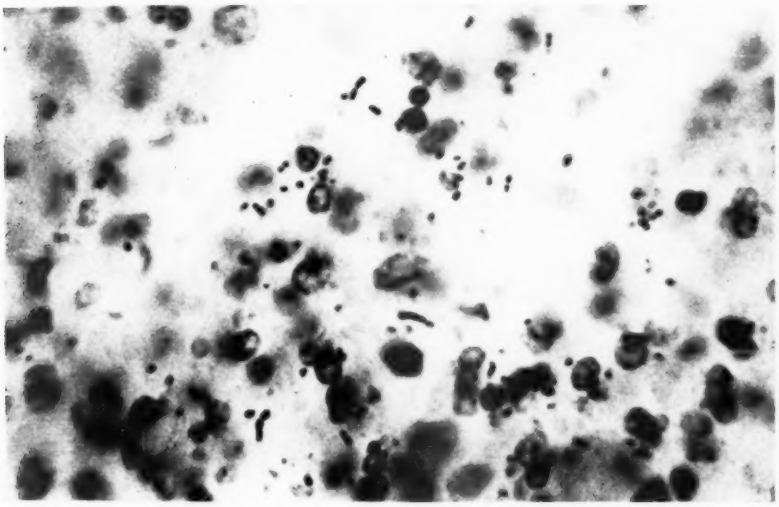

Fig. 10.—Photomicrograph of a portion of the contents of the vein shown in Fig. 9. Many cocci occurring singly, in pairs and in short chains (Gram-Weigert stain) are present. Similar cocci were found in the purulent contents of both ovarian cysts and in smears from the infected abdominal wound. We were unable to grow this organism in cultures from these three sources.

She was readmitted September 28 with a temperature of 102°. She stated that the fever had returned following menstruation. The vaginal sinus was dilated by Dr. Sutton. Smears from this material showed both bacilli and cocci and cultures were overrun by the colon bacillus (the latter probably a contamination).

The patient was operated on by me October 5. A partially collapsed adherent cyst arising from the right ovary was found. The enlarged left ovary was adherent to the posterior layer of the broad ligament. Peritoneal endometriosis was present in both the posterior and anterior culdesac. The appendix was removed and both ovaries were freed, the left without rupturing it. A supravaginal hysterectomy was done with removal of both tubes and ovaries (Fig. 6). The pelvis was drained with gauze through the sinus in the posterior vaginal vault. The abdominal wound later became infected and the patient did not leave the hospital until November 22.

The histologic structure of the endometrial cysts present in both ovaries was the same and was similar to that found in the previous case (Figs. 7 and 8). Smears made from both cysts and the infected abdominal wound showed gram-positive cocci occurring singly, in pairs and in short chains. Cultures from all three sources failed to show any growth. Sections of both ovaries stained by the Gram-Weigert method showed a similar organism, wherever a purulent exudate was present. (Fig. 10.) Dr. Victor C. Jacobson, pathologist to the Albany Hospital, believes that had an attempt been made to grow the organism found in these cysts and in the infected abdominal wound in special media and in different atmospheres, it might have been cultivated. As in the previous case the tubes and uterine mucosa were normal and the only evidence of infection found was that present in the ovaries. The cysts were evidently infected by bacteria carried in the blood stream. The source of this infection was not determined. It is impossible to state whether or not both ovaries were infected at the same time.

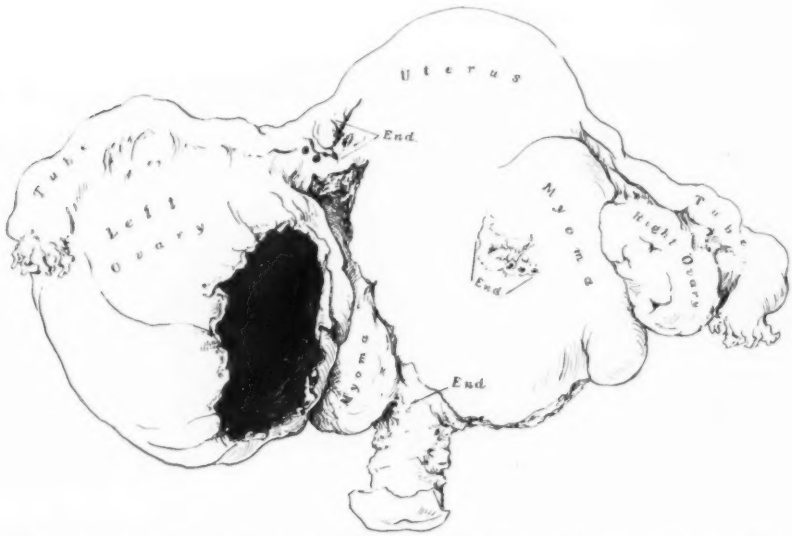

Fig. 11.—Posterior view (x ½) of the uterus, both tubes and ovaries (Case 3). Infected endometrial cyst of the left ovary (gram-negative bacillus) associated with an extensive peritoneal endometriosis and multiple leiomyomas of the uterus. The partially collapsed ovarian cyst was adherent by its under and lateral surfaces to the posterior surface of the uterus, broad ligament, sides of the pelvis and the sigmoid. The portion of the sigmoid fused with the cyst wall was markedly indurated, due to infection or endometriosis or both processes. A fistulous communication between the lumen of the sigmoid and cavity of the cyst was suspected at the time of the operation, but was not found. The portion of the cyst wall fused with the sigmoid was left attached to the intestine. Circumstantial evidence would indicate that the cyst became infected from the sigmoid, but a hematogenous infection cannot be excluded. Both *tubes* were *patent* and their mucosa was *normal*.

Judging by the comparative histologic study of the lining of the two cysts the larger one which had been drained and packed with gauze at the first operation seemed the older. The history of the case also suggests that the small cyst in the left ovary might have been infected during menstruation, after the patient left the hospital prior to her second admission. The failure to find bacteria in smears made from the purulent material obtained at the vaginal puncture might have been due to insufficient material being examined.

CASE 3.—*Infected endometrial cyst of the left ovary (due to a gram-negative bacillus).*

The patient, single, aged forty-seven years, complained of abdominal tender-

ness and a tumor. Menstruation had always been regular and in recent years associated with severe pain. Her general health had been good. In October, 1924, the patient had a severe attack of abdominal pain associated with fever. She was sick in bed for two days. The abdominal soreness had persisted until her admission to the Albany Hospital December 30, 1924. Her admission temperature was 99.8° and pulse 108. Heart, lungs, and urine were apparently normal. The lower abdomen was occupied by an irregular cystic-feeling tumor extending above the level of the umbilicus on the left side. On bimanual examination the tumor was apparently fixed and associated with a marked induration in the culdesac. On account of the large size of the tumor and the marked induration in the culdesac, a preoperative diagnosis of malignant ovarian cyst was made.

At operation December 31, 1924, a large cyst of the left ovary was found which

Fig. 12.—Photomicrograph (x 10) of a portion of the posterior uterine wall (Fig. 11), showing an endometriosis invading the uterus apparently from its peritoneal surface. Compare with the condition shown in Fig. 5. It could readily represent a later stage of the former. A similar process might have been present in the wall of the sigmoid which was adherent to the cyst. For one explanation of the origin of the endometriosis in this case, see the legend of Fig. 5.

was adherent to the posterior surface of the uterus, the left side of the pelvis and the sigmoid. The appendix was first removed. In attempting to free the cyst its walls were ruptured and a large amount of foul smelling, purulent, "chocolate" material escaped. A fistulous communication with the sigmoid which was adherent to it was suspected and looked for but was not found. The portion of the wall of the cyst adherent to the sigmoid was so densely fused with the wall of the intestine that no attempt to free it was made, but it was left attached to the intestine. The rest of the cyst with the entire myomatous uterus and the opposite tube and ovary were removed (Fig. 11). The pelvis was drained with gauze through the vagina and by a stab wound through the abdominal wall down to the sigmoid. An extensive peritoneal endometriosis was present in the posterior

culdesac (Fig. 12). The wall of the sigmoid adherent to the cyst was markedly indurated. At first this was thought to be due to infection, but might readily have been due to an endometriosis. The patient made a satisfactory convalescence.

Histologically the greater portion of the cyst was lined by granulation tissue showing an inflammatory reaction. In a few places an epithelial lining was present (Fig. 13) identical with that found in the four endometrial cysts of the previous cases. Typical endometrial tissue was not found in the cyst wall. The associated peritoneal endometriosis and the otherwise typical histologic structure of the ovarian cyst leaves little doubt as to its endometrial character. The inflammatory reaction in the cyst wall was not so acute as that in the previous cysts and suggested that the infection was of longer duration. Smears and cultures were not made of the cyst contents. Sections of a portion of the wall, containing an abscess, which were stained by Gram-Weigert and Goodpasture methods showed bacilli in those

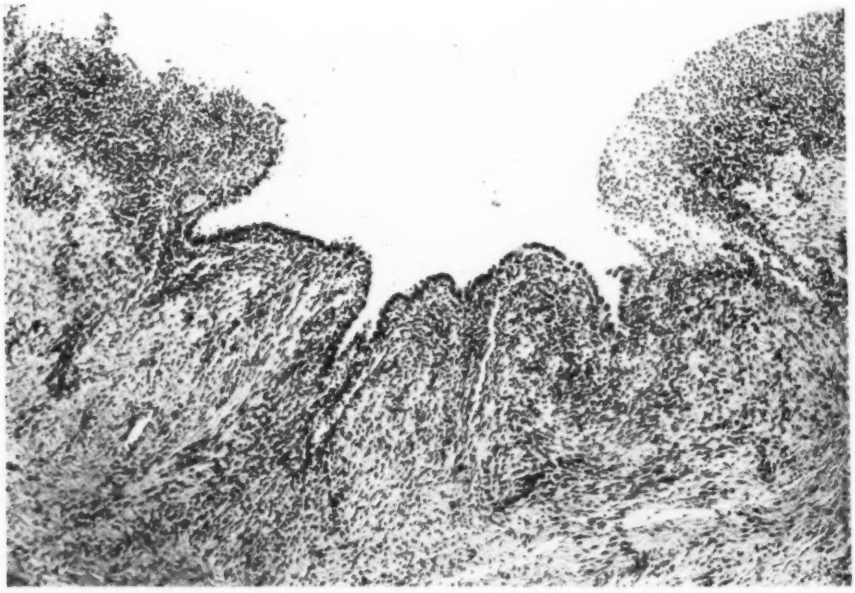

Fig. 13.—Photomicrograph (x 60) of a portion of the wall of the endometrial cyst of Fig. 11. An epithelial lining is present in the depression in the center, identical in structure with that in the four endometrial cysts of the two previous cases. On both sides of the depression epithelium is lacking. Here the cyst is lined by granulation tissue with an inflammatory reaction, not as acute as in the previous cases. Typical endometrial tissue was not found in the wall of this cyst. The associated peritoneal endometriosis, the character of the cyst contents and a lining identical with the previous cysts of known endometrial origin leave little doubt as to the endometrial character of this cyst.

treated by the Goodpasture stain which were morphologically identical with those found in the first case.

The right tube and ovary and the uterine mucosa were normal. The left tube was patent and its mucosa was normal. There was an angitis of the lymphatics of the mesosalpinx of the left tube, probably from the infected ovarian cyst. There was no other evidence of infection found, except in the left ovarian cyst and possibly in the portion of the sigmoid adherent to it. As stated before, the induration of the sigmoid could have been due to an endometriosis and not infection. Circumstantial evidence would indicate that the cyst contents became infected from the sigmoid. It was adherent to the latter. The contents had a foul odor

similar to that of an appendicular abscess. Gram-negative bacilli were found in the purulent exudate of the cyst wall. On the other hand, one cannot exclude a hematogenous origin for the infection, as undoubtedly occurred in the other cases.

SUMMARY

We have encountered three patients with infected endometrial cysts of the ovaries, two of which were bilateral.

In the first case reported endometrial cysts were present in both ovaries. The cysts were infected with a gram-negative bacillus having many of the cultural features of the paratyphoid group. A similar organism was obtained from the urine. The bacteria apparently reached the cysts through the blood stream. The primary source of the infection was not ascertained.

In the second case, endometrial cysts were also present in both ovaries. Cultures failed to show any growth, but a gram-positive coccus occurring singly, in pairs and in short chains was found in smears from the contents of the cysts, as well as in sections stained by the Gram-Weigert method. The abdominal wound became infected with a similar organism which also failed to grow in culture media. As in the previous case the bacteria apparently reached the cysts through the blood stream. The primary source of the infection was not ascertained.

In the third case, a large endometrial cyst of the left ovary, filled with foul smelling, purulent, bloody fluid was present. The cyst was

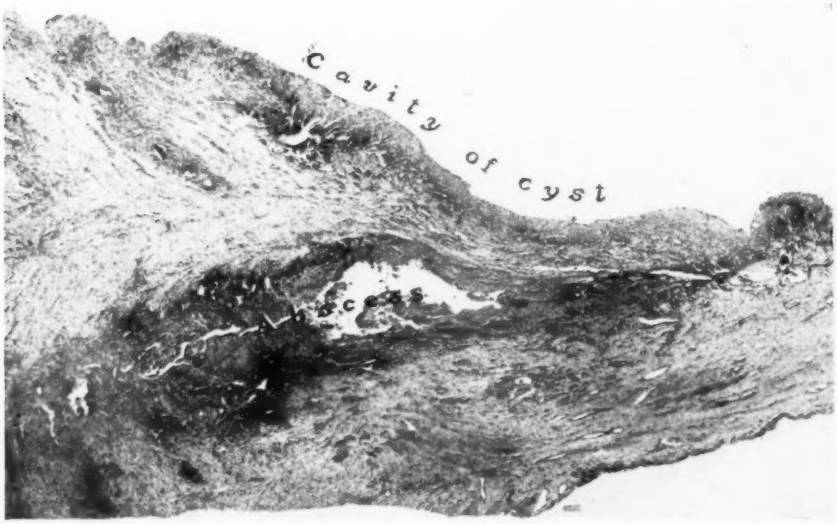

Fig. 14.—Photomicrograph (x 10) of a portion of the cyst wall shown in Fig. 11. The cyst here is lined by granulation tissue. An abscess is present in the wall of the cyst and in the contents of the abscess bacilli were demonstrated by Goodpasture's method, but not by the Gram-Weigert.

fused with the sigmoid. Cultures and smears were not made. Gram-negative bacilli were found in the purulent exudate of stained sections of the cyst wall. Circumstantial evidence indicated that the cyst became infected from the sigmoid, but the induration present in the portion of the wall of the intestine fused with that of the cyst might have been due to the extensive endometriosis which was present in the posterior culdesac. This cyst also might have been infected through the blood stream.

These three cases with five infected endometrial cysts are too few in number from which to draw conclusions. However, they suggest that endometrial cysts of the ovaries may readily become infected. Their bloody contents often containing bits of necrotic material, the trauma associated with their reaction to menstruation, the fact that an epithelial lining is often lacking in portions of the cyst (especially the larger ones), thus lessening the protection of their contents, all predispose to their infection from bacteria invading the cyst through any channel and especially that of the blood stream. In addition the incidence of perforation of their walls might lead to bacteria reaching their contents from infection in the pelvis at that time.

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CARBOHYDRATE METABOLISM IN ECLAMPSIA*

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DURING the past ten years the attention of many investigators in the field of obstetrics has been focused on carbohydrate metabolism in normal pregnancy, as well as in the toxemias of pregnancy. Various factors have been responsible for this renewed interest in this subject, but one of the outstanding reasons is the development of improved and new methods for blood-sugar determination. The theory of glycogen deficiency in vomiting of pregnancy, as first postulated by Duncan and Harding; new information regarding the respiratory quotient of the fetus which suggests that its energy supply is derived almost entirely from carbohydrates, which may possibly constitute a drain on the maternal sugar; experiments on the glycogen content of the liver at the end of pregnancy, as reported by Schmidt, Bickenbach and Jonen; as well as the discovery of insulin, have all served to stimulate interest in the behavior of maternal carbohydrates during normal and abnormal pregnancy.

The blood-sugar level is maintained by the addition or production of sugar on the one side and its removal from the blood stream on the other. Absorption of glucose from the intestines results in the deposition of glycogen in the liver and the hydrolysis of this glycogen, known as glycogenolysis, in the liver or muscles constitutes the main source of the blood sugar. A subsidiary source may be the production of glucose out of noncarbohydrate substances, such as amino acids and possibly fats (gluconeogenesis).

From the absorption of glucose from the intestines to its ultimate oxidation in the tissues, the rate of glycogenolysis stands out as one of the most important steps in the chain of carbohydrate metabolism. The breaking down of glycogen into glucose undoubtedly depends on several factors, such as the action of the diastatic enzyme (glycogenase), the hydrogen-ion concentration of the tissues, afferent nervous impulses to the liver, and the effect of certain hormones.

Oxidation of glucose in the tissues is the main factor in the removal of glucose from the blood stream. Excretion through the kidney, polymerization (glycogenesis) or conversion into noncarbohydrate substances are additional factors which tend to lower the blood sugar.

From this brief consideration, it must be evident that an intelligent understanding of the behavior of carbohydrate metabolism in any given

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state cannot be had unless one knows the conditions that prevail at each link in the carbohydrate chain. Among other things, it is necessary that we know the amount of glycogen in the liver and muscles, the rate of glycogenolysis, as well as the several factors on which it is dependent, the blood sugar, the rate of oxidation in the tissues, the quantity of lactic acid produced by muscular activity, the rate and amount of conversion of lactic acid to glycogen, and the extent of glyconeogenesis and glycogenesis. Of all these, however, the percentage of blood sugar constitutes our best single index of carbohydrate metabolism; but at the same time, it is well that we bear in mind that it gives us information at only one point in this long and somewhat complicated chain of sugar utilization. This being the case, it is apparent that fundamental changes may escape detection if we study only the amount of glucose in the blood stream. Consequently, one should guard against drawing conclusions which are based solely on such findings.

It is not the purpose of this paper to discuss in its entirety the problem of carbohydrate metabolism in eclampsia, because as yet we do not possess the experimental data essential to such an undertaking. Only after one knows how the many factors, which control the various steps in the carbohydrate chain, are affected in the eclamptic state, will it be possible to fully understand the behavior of sugar metabolism in this disease. Consequently in this paper we shall limit our remarks to the blood-sugar findings in eclampsia, and in our conclusions shall confine ourselves to the implications which may be drawn from so limited a field of study.

METHODS OF BLOOD-SUGAR DETERMINATION

The blood-sugar methods in general use today are based on the assumption that the amount of glucose present is directly proportional to the reducing power of the blood filtrate. There are, however, non-glucose reducing bodies in the blood, and it is mainly due to their presence that most methods yield values which are higher than the actual glucose content of the blood. Both the titrimetric and the colorimetric methods measure the reducing power of the blood, but in general it may be said that the colorimetric methods yield higher values than the titrimetric. Benedict has endeavored to devise a copper reagent which will not be affected by noncarbohydrate reducing bodies, such as creatinine, uric acid resorcinol and pyrocatechin, and it is mainly due to his efforts, as well as those of Folin, that our latest methods yield values only slightly above the true glucose content. Whereas the Folin-Wu method of 1919 showed the average normal blood sugar to be about 100 mg. per 100 c.c. of blood, the latest modification of Benedict's method has lowered this to about 60 mg. per 100 c.c. It must, therefore, be apparent that in any consideration of blood-

sugar findings it is imperative to know what method of determination was used.

In our work, extending from December, 1922, to date, we have used three methods: (1) Folin-Wu for the period ending December, 1925; (2) Benedict's 1925 method from January 1, 1926 to March 30, 1928; and (3) Benedict's 1928 method since March 31, 1928. These methods we have recently checked against one another, as well as against the titrimetric method of Hagedorn-Jensen. It should also be noted that in all our work the blood-sugar determinations were done immediately (or in a few instances within half an hour) after the blood was drawn from the patient. All the determinations on which our charts are based were done in duplicate by two, and in many cases in triplicate by three different individuals. Colorimetric readings are notoriously subject to individual variations depending upon the person taking the readings, and it is for this reason that no value was considered accurate unless the readings of each individual were checked to within 0.5 of a scale unit. We feel that as we have taken this unusual precaution our results should be regarded as accurate as can be obtained by the methods available at present.

CLINICAL MATERIAL

This paper is based on blood-sugar findings in 78 eclamptic women. In many of them we had the opportunity to observe the blood-sugar level daily during periods of a week or longer preceding the eclamptic outbreak. Where the patient entered the hospital after having had one or more convulsions, blood-sugar determinations were made immediately upon admission and before the administration of any medication; and these findings are reported in Table I. We have also studied the blood sugar at every possible time in relation to the eclamptic outbreak (before, during, and after), and in some instances as many as twenty daily determinations were made. In others, they were made each hour during periods of twelve or more hours, while in some they were made at intervals of every five minutes for an hour or more.

RESULTS

The findings reported in Table I substantiate our earlier contention that in eclampsia there is a definite tendency toward hyperglycemia. The three groups of cases, in which three different blood-sugar methods were used, give approximately the same degree of hyperglycemia, the averages being 147.1, 112, and 99.1 mg. respectively.

All blood-sugar values represented in the accompanying charts, with the exception of Fig. 1, were obtained by the latest method of Benedict, which gives a normal value of about 60 mg. per 100 c.c. blood. The chart in Fig. 1 presents the various blood constituents as routinely determined in this Clinic, and shows the changes commonly seen in eclampsia. The outstanding findings are the very low CO_2 com-

bining power, the elevated uric acid and sugar, and the normal values for non-protein nitrogen and the urea nitrogen, which became elevated only later in the disease. This chart also shows the remarkable effect of insulin on the low CO_2 combining power and the elevated blood sugar.

Fig. 2 gives the daily blood-sugar readings over a period of nineteen days in a

TABLE I. ECLAMPSIA—BLOOD SUGAR ON ADMISSION

CASE NO.	DATE	NO. CONV. AT HOME	NO. CONV. AFTER ADMISSION	SUGAR	SUGAR METHOD
1	8/24/23	2	1	135	Cases 1-15
2	10/ 2/24	1	1	167	Folin-Wu
3	10/21/24	1	8	167	(J. B. Chem. 38:
4	10/23/24	2	11	133	81, 1919.)
5	10/15/24	3	1	200	
6	1/12/25	1	0	103	
7	2/ 7/25	2	0	130	
8	5/ 1/25	2	1	220	
9	2/25/25	1	15	125	
10	3/ 4/25	1	0	105	
11	3/ 5/25	1	3	100	
12	5/28/25	1	2	182	
13	7/ 6/25	2	7	122	
14	8/29/25	10	12	193	
15	8/ 6/25	2	41	125	
Average:	147.1 mg. per 100 c.c. blood, as contrasted with normal of 100 mg.				
16	1/ 2/26	1	0	100	Cases 16-44
17	1/13/26	1	1	71	Benedict
18	1/11/26	4	8	118	(J. B. Chem. 64:
19	4/11/26	2	11	145	211, 1925.)
20	5/13/26	1	0	143	
21	7/20/26	2	0	79	
22	7/30/26	6	6	160	
23	8/22/26	1	0	105	
24	9/ 9/26	1	1	80	
25	9/15/26	2	2	143	
26	10/ 2/26	3	2	105	
27	10/14/26	7	12	105	
28	11/30/26	1	2	160	
29	12/ 3/26	2	1	133	
30	1/ 6/27	2	2	83	
31	2/12/27	2	0	80	
32	3/ 4/27	1	1	100	
33	3/ 4/27	4	3	167	
34	5/21/27	11	1	91	
35	8/ 2/27	2	1	50	
36	8/15/27	2	0	87	
37	8/23/27	3	1	133	
38	9/ 3/27	2	4	260	
39	11/28/27	1	3	62	
40	12/ 1/27	2	2	143	
41	12/27/27	1	1	86	
42	1/11/28	10	10	95	
43	2/20/28	1	0	84	
44	3/26/28	1	1	80	
Average:	112 mg. per 100 c.c. blood, as contrasted with normal of 75 mg.				
45	5/16/28	1	6	69	Cases 45-50
46	6/19/28	1	0	65	Benedict
47	6/20/28	8	1	81	(J. B. Chem. 76:
48	6/27/28	1	0	75	457, 1928.)
49	7/15/28	1	0	200	
50	8/10/28	4	2	105	
Average:	99.1 mg. per 100 c.c. blood, as contrasted with normal of 60 mg.				

patient with postpartum eclampsia, and is significant in that the blood sugar was below normal for the three days preceding labor, had reached the normal level on the day of delivery, and remained so the following morning when the eclamptic outbreak appeared. The patient had three postpartum eclamptic convulsions and these are noted in the chart.

The two blood-sugar curves in Fig. 3 represent hourly determinations in two patients suffering from eclampsia. It will be noted that the blood sugar occupies very different levels in the two charts. In the one it is about 130 mg. and in the other about 75 mg.

In Fig. 4 are plotted four determinations of the blood sugar and CO_2 combining power made during the course of one hundred minutes, and show the variations before and after a convulsion. It is possible, however, that rapid changes may

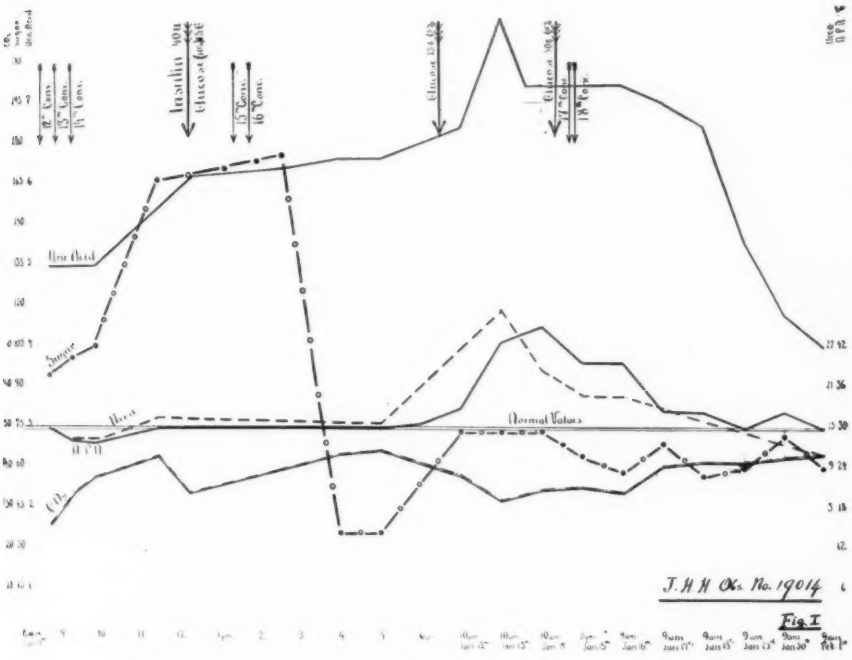

Fig. 1.

occur, which would be overlooked in such a curve because of the length of time elapsing between the readings, and it is for this reason that Figs. 5 and 6 are presented. It will be noted that the patient U. 18,596 died (Fig. 5), while all other patients, whose blood-sugar curves are considered in this paper, recovered. In Figs. 5 and 6 the blood sugar is plotted at five-minute intervals and the exact time of the convulsion is indicated by means of an arrow. Both these charts give us a very clear conception of the behavior of the blood sugar immediately before and after a convulsion. Fig. 5 shows that it remained almost constantly at 115 mg. before the fourth convulsion and rose to about 125 mg. after it. The following convulsion occurred at a level of 120 mg. We have an almost identical picture in Fig. 6. In this patient the blood sugar was 76 mg. at 11:44 A.M. and 69 mg. at 11:49. One minute later (11:50 A.M.), a convulsion occurred with the result that the blood sugar rose to 83.5 mg. within the next seven minutes. Five minutes later it had fallen to 65.5 mg., yet no convulsion occurred.

Lastly, we present a patient (W.) with intrapartum eclampsia, who was treated conservatively, delivered of a living child, and recovered. The course of the eclampsia in this patient is very interesting, and is shown in Fig. 7. She had two sets of

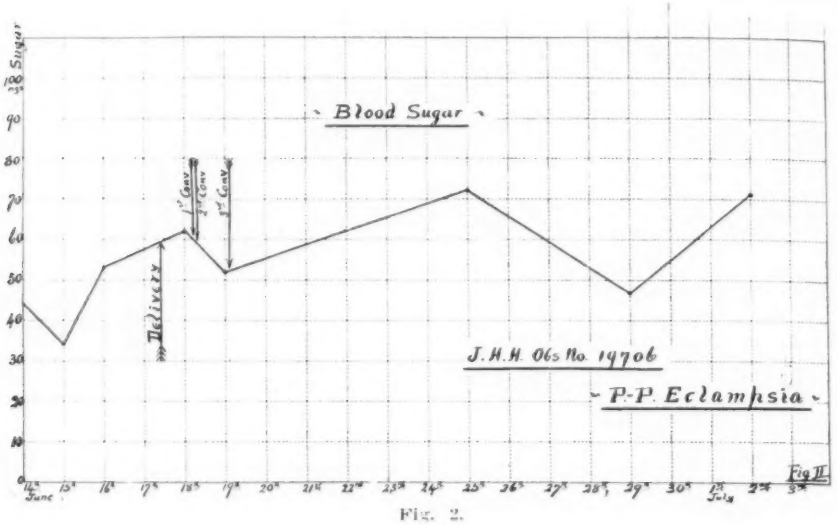

Fig. 2.

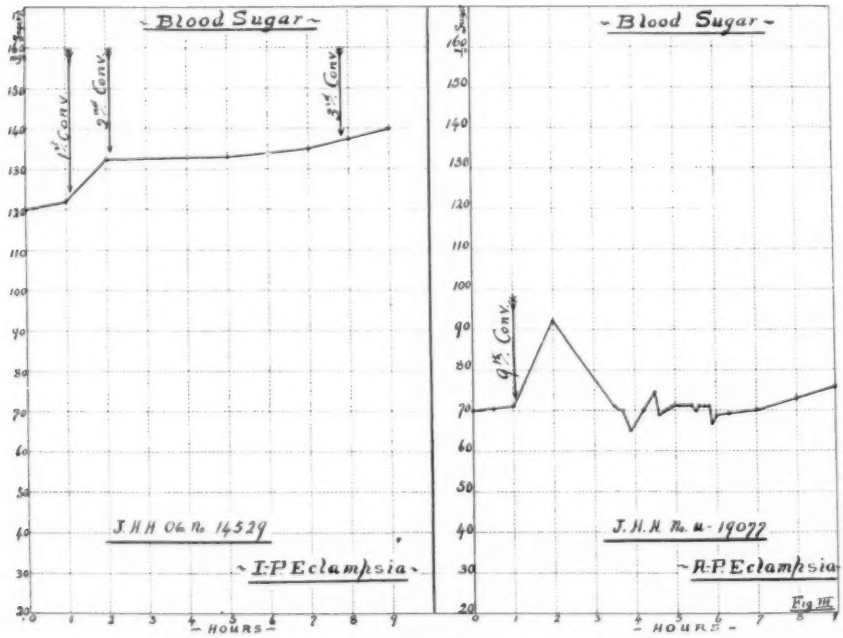

Fig. 3.

convulsions: the first to thirteenth occurring on the day of admission, while the fourteenth to the twenty-first did not occur until three days later. On the day of admission the blood sugar ranged between 200 to 230 mg. and dropped to 100 mg. following the administration of insulin. Following that it gradually fell to

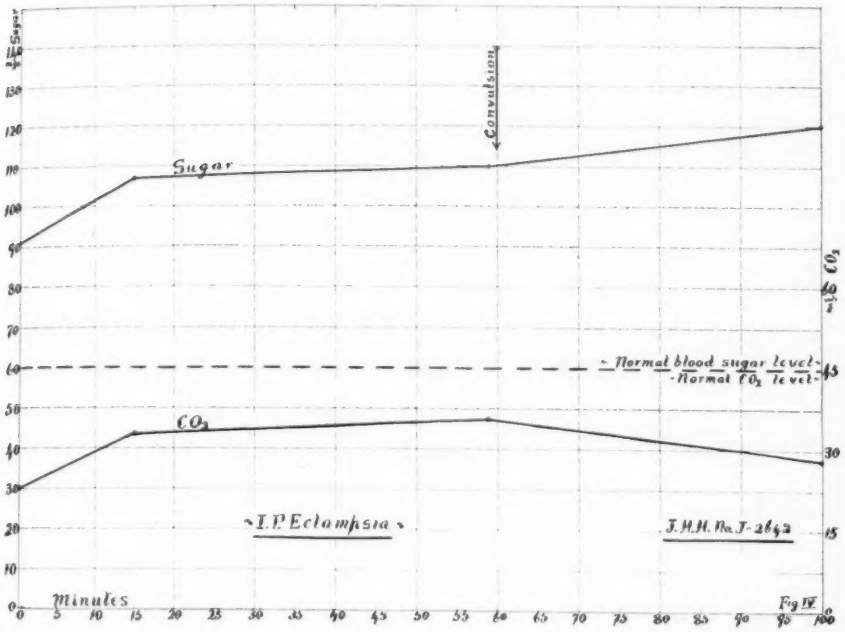
Sugar
Convulsion
Sugar
CO_2
Normal blood sugar level
Normal CO_2 level
CO_2
I.P. Eclampsia
J.H.H. No. J-2642
Minutes
Fig IV

Fig. 4.

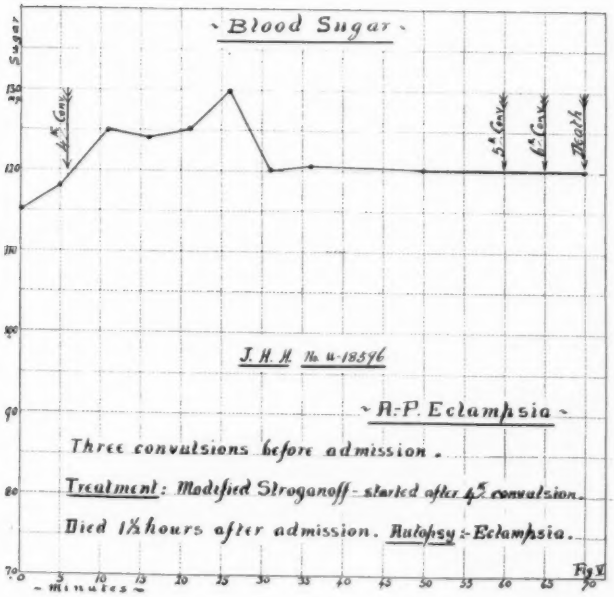
Blood Sugar
Sugar
1st Conv.
5th Conv.
6th Conv.
Death
J. H. H. No. u-18596
A.-P. Eclampsia
Three convulsions before admission.
Treatment: Modified Stroganoff - started after 4th convulsion.
Died 1½ hours after admission. Autopsy:- Eclampsia.
Minutes
Fig V

Fig. 5.

77 mg. and then slowly rose to 107 mg. Her second group of convulsions occurred at a blood-sugar level of about 100 mg. The administration of insulin at that time lowered the blood sugar to 30 mg. but no convulsion followed this drop, as may be seen from the chart. The blood sugar and CO_2 combining power during the first group of convulsions are charted in minutes in Fig. 8, which clearly shows the behavior of the blood sugar immediately before and after a convulsion, as well as the effect of insulin on the blood sugar and CO_2 combining power.

DISCUSSION

Many observers (Benthin, Walthard, Obata and Hayashi, Stander, Widén and others) have reported hyperglycemia in eclampsia. A detailed study of the blood sugar in eclampsia was undertaken in this Clinic because two investigators (Titus and Levy) claim that hypoglycemia is

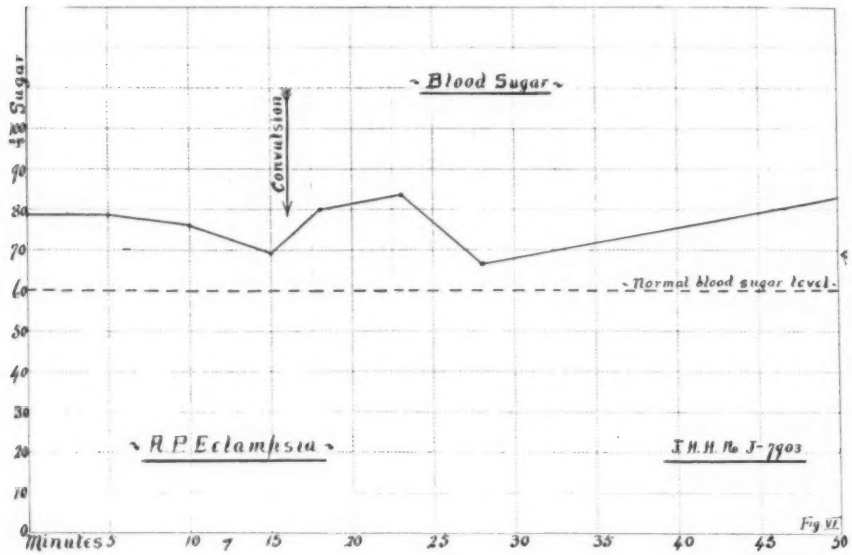

Fig. 6.

characteristic of eclampsia and particularly because Titus actually attributes the convulsion to relative hypoglycemia. By this he means that a decrease in the blood sugar immediately precedes the convulsion, and he holds that the eclamptic convulsions are comparable to those of insulin hypoglycemia. Titus also concludes that the general trend of the sugar content of the blood in eclampsia is downward.

Our findings, as presented in the charts, are contrary to such a contention. None of our charts show a downward tendency of the blood sugar, except, of course, where insulin was administered. In no case could we find a sudden decrease in blood sugar before a convulsion, unless one considers the fall of 7 mg. noted in Fig. 6 as a relative hypoglycemia. This, however, is not much greater than the experimental error inherent to all colorimetric methods.

In only three instances in the 50 cases reported in Table I, do we see blood-sugar values which may be regarded as hypoglycemic, and even these are far above the convulsive hypoglycemic level.

As explained at the beginning of this paper, blood-sugar findings do not permit us to draw any conclusion concerning the glycogen content of the liver. We do not contend that there is no glycogen deficiency in eclampsia, as all available experimental data probably indicate its occurrence. We do, however, contend that until we possess accurate information as to the amount of glycogen available, as well as the many factors controlling carbohydrate metabolism, it would seem wise to refrain from too wide speculation.

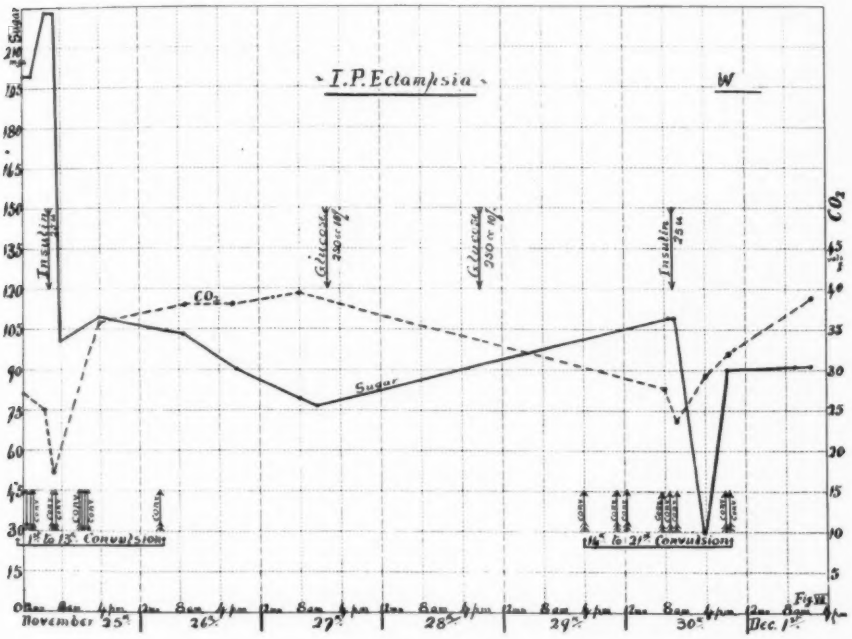

Fig. 7.

We wish to state, as in our earlier publications, that in this clinic insulin is used only to combat dangerously low CO_2 values. We have found it of value in helping to overcome a marked acidosis, and our results, based upon a series of over 30 treated cases, warrant its routine employment wherever the CO_2 combining power drops to 25 vol. per cent or less. We do not employ insulin in patients in whom the CO_2 combining power stays above 30 volumes per cent. The effect of insulin on the CO_2 is clearly demonstrated in Figs. 7 and 8.

We are still of the opinion that when the physician is unable to follow CO_2 readings in a laboratory, and has to deal with a persistent coma following a convulsion, it may be advisable to administer insulin

(15 to 20 units) with a protective dose of glucose (2 gm. glucose per unit of insulin). We have had no untoward results following insulin therapy, although in two instances the blood sugar was temporarily lowered to 30 mg. per 100 c.c. blood. It should, however, be stated that this was brought about by an unusually large dose of insulin (30 units) which was given purely for experimental purposes. We do not advocate such large doses, but on the contrary advise that the amount should not exceed 15 to 20 units in combination with 30 to 40 gm. of glucose. Some may, of course, prefer to treat the acidosis by the administration of alkali, which has essentially the same effect. Whatever one's preference may be, it is essential that some type of antiacidosis treatment be instituted in such cases.

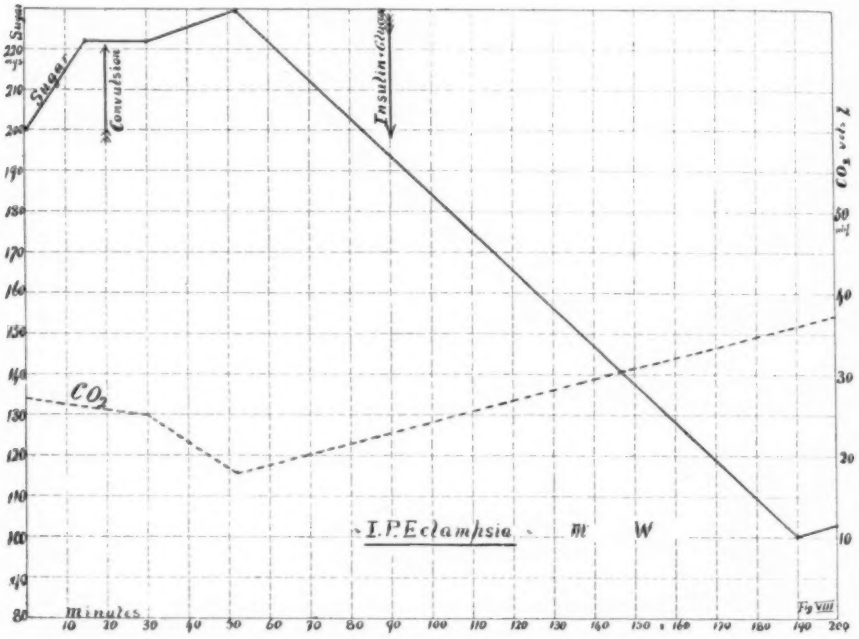

Fig. 8.

We have employed glucose intravenously in solutions ranging from 5 to 25 per cent and in amounts from 20 to 80 gm. and we are convinced that glucose per se is not a specific therapy in eclampsia. On the other hand, it doubtless serves certain useful purposes, such as stimulating diuresis and combating liver injury. As yet, we do not possess any satisfactory treatment for eclampsia, and probably will not, until the actual etiology of the disease is discovered. Meanwhile the best treatment appears to be the most conservative; and the most satisfactory results undoubtedly follow a combination of conservative treatment (sedatives, antiacidosis therapy, glucose, etc.) together with operative interference in certain cases under local or spinal anesthesia.

CONCLUSIONS

1. In the majority of cases of eclampsia there is a tendency toward hyperglycemia.

2. In general the blood-sugar level remains fairly constant throughout the disease.

3. As there is no relative hypoglycemia, that condition cannot be utilized to explain the production of eclamptic convulsions, and these convulsions are not comparable to insulin hypoglycemic convulsions.

4. Following eclamptic convulsions there is a slight rise in blood sugar.

5. A patient may have eclamptic convulsions with the blood sugar at different levels, and these levels are not greatly disturbed by the convulsions.

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(For discussion, see page 153.)

III. FLUCTUATIONS IN BLOOD SUGAR DURING ECLAMPSIA: THE RELATIONSHIP BETWEEN THE BLOOD PLASMA SUGAR AND THE CORPUSCULAR SUGAR VARIATIONS IN ECLAMPSIA AS SHOWN BY SERIAL CURVES. PRELIMINARY REPORT*

By Paul Titus, M.D., and E. W. Willetts, M.D., Pittsburgh, Pa.

(From the Department of Obstetrics and Gynecology, St. Margaret Memorial Hospital)

IN TWO previous communications[1, 2] we reported blood chemistry studies which showed that during the course of an attack of eclampsia, there are wide fluctuations in blood-sugar values in surprisingly short intervals of time, and that it is characteristic for the convulsions to be preceded by a sharp fall and followed by a rise in blood sugar. Corroborative evidence of this discovery has recently been published by Laferty, Nark and Sweeney[3] of Philadelphia.

These periods of sudden lowering of blood sugar in eclampsia, which

*This study is one of the series of investigations in the toxicoses of pregnancy being conducted by the John C. Oliver Memorial Research Foundation at the Laboratory of the St. Margaret Memorial Hospital.

are unlike anything else familiar to clinicians except those due to overdosage with insulin, we designated by the term "relative hypoglycemia." By this we mean that the levels of blood-sugar values at which eclamptic convulsions take place may be high or low as com-

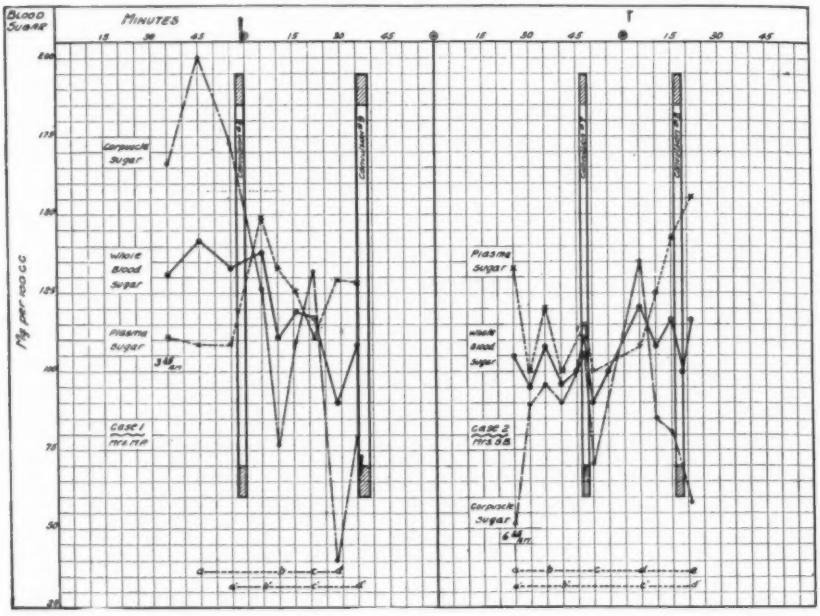

CHART 1.—Whole blood sugar, plasma sugar and corpuscular sugar curves contrasted in two rapidly progressing cases of eclampsia. (Cases 1 and 2.)

CASE 1. SIXTY MINUTES TIME

SUGAR LEVELS	INITIAL	HIGHEST	LOWEST
Whole blood	131 mg.	142 mg.	90 mg.
Plasma	111 mg.	148 mg.	108 mg.
Corpuscles	167 mg.	200 mg.	40 mg.

Period a to b: Period of marked depression of corpuscular sugar with one convulsion.

Period a′ to b′: Following convulsion plasma levels increase from some extraneous source.

Period b to c: Corpuscular sugar storage increased from plasma supplies as indicated by period b′ to c′ during which plasma sugar content decreases.

Period c to d: A second serious depression of corpuscular sugar at end of which convulsion occurs.

Period c′ to d′: Beginning restoration of plasma sugar.

Note behavior of whole blood sugar:

Period a to a′ shows a slight fall in whole blood sugar preceding the convulsion, followed by slight rise to point b′. Then there occurs from b′ to d a long downward trend ranging in twenty-three minutes from 133 mg. down to 90 mg. followed by the next convulsion. One momentary effort toward recovery occurs during period b to c but could not be sustained.

CASE 2. FIFTY-SEVEN MINUTES TIME

SUGAR LEVELS	INITIAL	HIGHEST	LOWEST
Whole blood	105 mg.	121 mg.	90 mg.
Plasma	133 mg.	156 mg.	100 mg.
Corpuscles	52 mg.	135 mg.	52 mg.

Period a to b: Recovery of corpuscular sugar content from point of greatest depression, simultaneous with loss of sugar by plasma in period a′ to b′.

Period b to c: Fall in corpuscular sugar during which convulsion occurs.

Period b′ to c′: No loss and even slight gain in total plasma sugar but plasma graph crossed by whole blood sugar line thus indicating relative loss in plasma sugar content.

Period c to d: Restoration of corpuscular sugar content to high level during period (b′ to c′) of relative sugar loss to plasma.

Period d to e: Sharp loss in corpuscular sugar during which time convulsion occurs.

Period c′ to d′: Influx of sugar to plasma stream.

Note behavior of whole blood sugar:

Period a′ to b′: one of fluctuation ending in depression and followed by convulsion.

Period c to d: usual postconvulsive recovery to higher sugar levels.

Period d to convulsion: Moderate fall in whole blood sugar.

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pared to "normal" values, but, as said before, almost invariably they follow a sharp fall from some higher level. Because it has been authoritatively shown[4, 5] that the blood-sugar values at which hypoglycemic symptoms may be induced by insulin injections depend not so much on the actual level of the blood sugar as they do on the rapidity with which that level has been reached in the fall from higher levels, we reasoned that an eclamptic convulsion was analogous and therefore might properly be termed an hypoglycemic reaction. Moreover the rise following the convulsion is similar to that noted in experimental animals dosed with insulin to the point of convulsion.

These new blood chemistry findings and conclusions were both consistent and convincing because they accomplished several things; they established the relationship between the convulsions of eclampsia and a disturbance in carbohydrate metabolism which we had previously postulated; they offered a conclusive explanation for the beneficial effects previously noted in eclampsia from intravenous injections of dextrose; they advanced our knowledge of the etiology of this disease to the extent which we have outlined; and we believe that they also establish a relationship between the toxemias of both late and early pregnancy since we have found similar but much more slowly attained low blood-sugar values in hyperemesis gravidarum.[5]

A paper by Foshay[6] on the sugar content of the erythrocytes as an index of insulin action, suggested to one of us (Titus) the idea that even more information regarding the etiologic and clinical significance of these fluctuating blood-sugar curves in eclampsia might be gained

from a study of the corpuscular sugar and of the blood plasma sugar considered separately.

This has been done in the cases of three eclamptic women not included in our earlier series, and sufficient information has been obtained to warrant discussing the findings in a preliminary report, from which we may make deductions without attempting definite conclusions.

Apparently it will be necessary in this study as in the earlier ones to divide eclampties into two main groups for comparison; the slowly progressing type of cases, and the rapidly progressing or fulminating cases.

The two cases in Chart 1 are excellent examples of the latter and are strikingly alike in many of their characteristics. In these the various fluctuations are a matter of only a few minutes, whereas in the others (vide ref.[2]), as in Chart 2, they are more a matter of half hours or longer.

Naturally the more striking findings are to be noted in the swiftly rather than the slowly progressing cases, and this fact was noted in our earlier reported curves.

GENERAL CHARACTERISTICS OF THE WHOLE BLOOD-SUGAR CURVES IN ECLAMPSIA

The whole blood-sugar curves are also plotted for the sake of comparison, and these conform to the general characteristics of those shown in our earlier papers.

In brief these tendencies are as follows: first, a marked fluctuation in blood sugar in short intervals of time; second, a decided fall preceding a convulsion; third, as the nervousness and tremor of the approaching convulsion come on, a rise in blood sugar begins so that those specimens taken only a moment or so before a convulsion actually occurred, were usually slightly higher than those two to three or four minutes before; fourth, this rise in blood sugar continued after a convulsion, then either fluctuated for a time or subsided to the lower levels preceding the next convulsion; fifth, the general trend of the blood sugar was slowly downward.

WHOLE BLOOD SUGAR SEPARATED INTO CORPUSCULAR AND PLASMA SUGAR DETERMINATIONS DURING ECLAMPSIA

In Cases 1 and 2, it will be noted that the convulsions occur on the down sweep of the corpuscular sugar and that this fall continues on through the period of the convulsion, recovering more slowly than does the plasma sugar.

It is true that the plasma sugar usually shows a decline before convulsions but this is less marked and its rise after the convulsion is almost as striking a phenomenon as is the fall of the corpuscular sugar before and during a convulsion.

In these cases (1 and 2) in which the corpuscular sugar and the

plasma sugar have been separately determined this preliminary study seems to indicate that circulating sugar which is more mobile or most readily available is in the plasma, and that it is not until the corpuscles are deprived of their sugar that a convulsion occurs. We have stated earlier that the convulsion might probably be looked upon as a protective measure in eclampsia. It would seem that following this

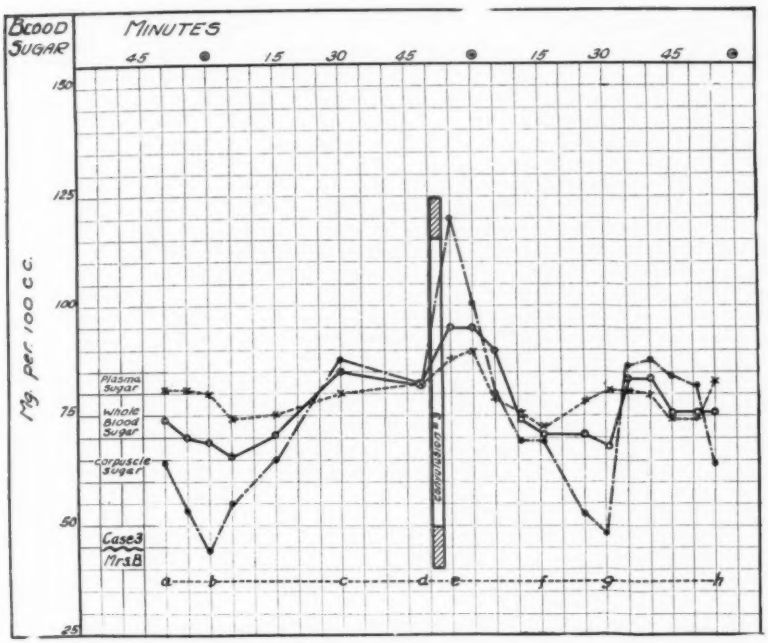

CHART 2.—Whole blood sugar, plasma sugar and corpuscular sugar curves contrasted in slowly progressing case of eclampsia.

CASE 3. ONE HUNDRED AND TWENTY-FIVE MINUTES TIME

SUGAR LEVELS	INITIAL	HIGHEST	LOWEST
Whole blood	74 mg.	95 mg.	66 mg.
Plasma	81 mg.	90 mg.	73 mg.
Corpuscles	64 mg.	120 mg.	44 mg.

Period a to b: Depression of sugar most marked in corpuscular curve.

Period b to c: Rise of sugars to safer levels. Patient was clinically improved during this time.

Period c to d: Moderate fall in sugars followed by third and last convulsion of illness.

Period d to e: Usual postconvulsive rise, especially marked in corpuscular sugar content.

Period e to f: Pronounced fall in sugars.

Period f to g: Corpuscular sugar fall continues from period e to f but is suddenly checked by influx of sugar into plasma stream.

Period g to h: Metabolic equilibrium being restored; sugar fluctuations ceasing; patient recovering consciousness.

terrific muscular upheaval glycogen is forcibly pulled out from the liver even to the extent of exhausting those hepatic reserves not ordinarily affected, to be poured into the circulation in response to this demand. In any event there is an increase in the amount of sugar appearing in the plasma, and according to our newest curves these plasma sugar values then subside during the period in which the corpuscular sugar increases, obviously the result of the replenishment of the corpuscles from the plasma by which they are surrounded.

Case 3 is an example of slowly progressing eclampsia similar to certain of those of our earlier tables. The fluctuations are not so wide nor so violent nor frequent. Moreover we cannot demonstrate that hypoglycemic fall in whole blood sugar preceding this convulsion which was the patient's third and last such seizure. We believe that in this instance our failure to demonstrate this was due to our having taken only two specimens in the entire half hour preceding the convulsion instead of taking them at five-minute intervals, having relaxed our vigilance because the patient seemed to be recovering. This convulsion came as a clinical surprise but it will be noted that following it the cell sugar proved to be falling sharply while the plasma sugar was making a moderate gain, the cell sugar then began to increase rapidly and toward the end of the graph the equilibrium of all three curves was becoming steadier and more stable at which time the patient was recovering.

In a violently active eclamptic, as in Cases 1 and 2, the original metabolic disturbance is probably the carbohydrate deprivation which we consider to be the chief etiologic factor in this disease. Violent falls in blood sugar are naturally followed by strenuous efforts toward recovery to the higher levels and the storm quickly becomes one of great fluctuating waves. During this storm it is reasonable to consider that sugar is torn again and again from the corpuscles only to be restored to them from the plasma, the process repeating itself until the patient either dies or else her stuporous and comatose condition maintains her so absolutely at rest that her metabolic upset again becomes more stable and she recovers, at least from this acute condition.

All of these convulsions can usually be stopped abruptly at any point by the hypodermic administration of morphine and the intravenous administration of hypertonic dextrose solution. In view of these recent findings, the rationale of this treatment, hitherto empiric, now appears to be both consistent and reasonable.

These three patients were thus treated, and all three recovered.

POSSIBLE SIGNIFICANCE OF CORPUSCULAR SUGAR DEPLETION

In commenting on this in connection with insulin hypoglycemic toxemia occurring at varying levels of whole blood sugar, oftentimes

surprisingly high, Foshay[6] says that insulin reactions can occur without hypoglycemia but that they do so simultaneously with the reduction of the corpuscular glucose. He terms this a cytoglycopenia or a status of glucose impoverishment within the cell. He says further that it seems highly probable that one of the physiologic actions of insulin on blood is a deprivation or a reduction of the capacity possessed by erythrocytes to contain glucose. The experiments of Cori[7] suggested that this is true also of muscle cells. MacLeod[8] has demonstrated quantitatively that after insulin there is a reduction in the glucose in the leg muscles. Foshay continues "although it is very entertaining to speculate upon what the result would be if this action of insulin occurred in brain cells or other nervous tissue cells, for want of evidence one is not entitled to offer any general theory of the mechanism of the hypoglycemic reaction." We venture to suggest that this latter may offer a reasonable clue to the actual mechanism of eclamptic convulsions.

H. D. Lightbody, Director of the Oliver Memorial Research Foundation at this Hospital after reviewing this manuscript makes the following comments on this study: "No attempt has been made to further separate the total cell sugar into 'true' and 'apparent' sugar as does Somogyi (J. Biol. Chem. 78: 117, 1928). It seems possible that such a procedure might throw some light on the problem. Somogyi finds that about one-third of the total corpuscular reducing substance, and about one-twelfth of that of the serum is nonsugar. The present work gives no hint as to whether it is the sugar alone, or sugar and nonfermentable reducing substance together that are responsible for the decreases shown, and are precursors of uric acid. I suggest that this may be the source of that increase in uric acid which is now considered to be a characteristic 'blood chemistry' finding in eclampsia."

We would say in this connection that such a differentiation would be essential if the relational values between plasma and corpuscular sugar (apparent or true as the case may be) in single specimens only were being considered. In these cases however we plot a curve showing the relationship between a series of corpuscular apparent sugar readings, considered in conjunction with each other. The same is true of the plasma sugar readings, and the actual numerical relationship of the one series of readings to the other is a relatively minor matter as compared to the behavior of the two curves toward each other. In other words, these graphs could easily be corrected according to the directions of Somogyi, merely by subtracting the proper percentage for nonsugar reducing substance in the plasma and the proportionately greater percentage in the cells in each individual reading. The sole result of this would be to place the graphs somewhat nearer together on the chart, while the general relations throughout the curves would remain identical. The fluctuations would be the same.

Briefly, we are much more concerned in these studies with relationships than we are with actual numerical values.

LABORATORY METHODS

In the work reported above all the blood specimens were taken in tubes containing sodium fluoride and thymol as the anticoagulant in order to prevent any change in sugar values (John, H. J.[9]), although

in almost every instance the tests were made promptly after specimens were collected. The method of Folin and Wu was used for all determinations of whole blood and of plasma sugar. The cell sugar was estimated by the following equation:

$$\frac{\text{Per cent of blood sugar (per cent serum volume} \times \text{per cent serum sugar)}}{\text{Per cent cell volume}} = \text{Per cent cell sugar}$$

A fresh standard was made for each fresh group of specimens tested as we had previously found that the color of standard fades appreciably during time required for setting up new groups.

In taking specimens it sometimes happened that the quantity of blood obtained was not enough to permit using the usual 2 c.c. quantity for the Folin-Wu method on the whole blood plus a similar amount sufficient for plasma sugar determinations. One of us (Willetts) found and now suggests as a routine procedure that 0.5 c.c. of whole blood is quite sufficient if the centrifuge is used instead of the filter for removal of precipitated proteins. This method was also used in obtaining the filtrate of the plasma when less than 2 c.c. was to be had.

The detail of this is merely that the whole blood is centrifugalized for twenty minutes at approximately 3000 revolutions per minute. We were able to demonstrate that centrifugalization for a longer period is unnecessary because no further packing of cells takes place after twenty minutes; whereas less time is not sufficient for complete packing of cells.

It has been reasonably suggested (Director Lightbody) that the practice of collecting different amounts of blood on the same amounts of salt anticoagulant is open to criticism unless it can be shown that this had no material effect on the cell volume.

We have asked Lightbody to analyze our figures in this respect and his findings appear as a separate communication in a companion paper to this, published herewith. His findings offset this possible criticism.

SUMMARY

I. We have previously demonstrated wide fluctuations in blood-sugar values during eclampsia with the convulsions almost invariably preceded by sharp falls in blood sugar. These periods of suddenly lowered values we termed "relative hypoglycemia." These findings have been corroborated now by others.

II. These conclusions were both consistent and convincing because they accomplished several things; they established the relationship between the convulsions of eclampsia and a disturbance in carbohydrate metabolism which we had previously postulated; they offered a conclusive explanation for the beneficial effects previously noted in eclampsia from intravenous injections of dextrose; they advanced our knowledge of the etiology of this disease to the extent which we have

outlined; and we believe that they also establish a relationship between the toxemias of both late and early pregnancy since we have found similar but much more slowly attained low blood-sugar values in hyperemesis gravidarum.

III. We now suggest that fractional blood-sugar values be determined for similar curves during eclamptic seizures, i.e., that the sugar of the blood be determined as blood plasma sugar and corpuscular sugar considered separately.

IV. In a preliminary report it may be said: (a) that the circulating sugar which is most mobile or most readily available is in the plasma, and (b) that it is not until the corpuscles are deprived of their sugar that a convulsion occurs (i.e., on the down sweeps of the corpuscular sugar curve). (c) The first evidence of recovery is an increase in plasma sugar probably obtained from the hepatic stores, (d) after which the plasma sugar values subside as the corpuscular sugar increases, obviously during replenishment of the erythrocytes from their surrounding plasma.

V. It is again pointed out that these fluctuations as well as the eclamptic convulsions can usually be stopped abruptly at any point by the hypodermic administration of morphine and the intravenous administration of hypertonic dextrose solutions, now to be utilized as specific rather than empiric therapeutic measures.

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IV. FLUCTUATIONS IN BLOOD SUGAR DURING ECLAMPSIA

Analysis of Titus-Willetts Data to Determine Effects of Anti-Coagulant on Plasma-Volume and Cell-Volume Relationships

By H. D. Lightbody, Pittsburgh, Pa.

(Director Oliver Memorial Research Foundation, St. Margaret Memorial Hospital)

IN THE foregoing study by Titus and Willetts it was thought that the collection of differing amounts of blood on the same amounts of anticoagulant salt might alter the cell volume through osmotic pressure. Consequently it was deemed advisable to analyze the data in the protocols of the Titus-Willetts investigation in order to establish whether or not the ratio of plasma volume : cell volume is a constant.

Of course the change of sugar content of the cell would also tend to produce change in volume, but osmotic changes due to the "sugar" shift would be comparatively small, i.e.,

Mol. wt. glucose 198.14.

Sugar conc. 1100 mg. per liter or 0.0053 moles.

Mol. wt. sodium fluoride 42.

NaF. conc. 10,000 mg. per liter or 0.23 moles. If the ionization is complete; $0.23 \times 2 = 0.46$ moles.

$$\frac{0.46}{0.0053} = 87$$

That is, the salt will exert approximately 87 times as much osmotic force as the normal content of sugar. Actually it will be much greater than this because the sodium fluoride probably will not be equally well distributed between cell and plasma.

Since sufficient anticoagulant for 10 c.c. was placed in each tube used for blood collection it may be asked if the differences in sugar distribution may not be due to differences in cell volume. While it is perhaps not possible to entirely eliminate this possibility, if we may assume that the cell sugar is free to move from cell to plasma, and this freedom is not altered by slight changes in cell volume, it is possible to show that the changes are not significant.

The data of the Mrs. P. case which includes 19 series of determinations may best be used. Since the plasma and cell volumes both are used in the equation and because each is influenced by the presence of varying amounts of the anticoagulant, the ratio plasma volume : cell volume becomes the point of interest. This ratio was determined for each of the 19 measurements. The maximum was found to be 2.466 and the minimum 1.000, and the mean error of a single observation determined by the formula $\sqrt{\frac{d_1^2 + d_2^2 - d_n^2}{n-1}}$ was found to be 0.534;

an error of approximately 30 per cent. That this is due to the varying size of the blood samples collected on a constant amount of salt anticoagulant is seen by dividing the data into three groups, one of greatest volume of blood, one of smallest amount, and one representing more nearly the average. Thus in Group 1 (Samples 2, 4, 5, 6, 9, and 12) the mean sample volume is 7.4 c.c. and the mean ratio plasma volume : cell volume is 1.365. In Group 2 (Samples 1, 7, 10, 14, 16, 17, and 19) the mean sample volume is 6.2 c.c. and the mean ratio is 1.474. In Group 3 (Samples 8, 11, 13, 15, and 18) the means are 4.8 c.c. and 2.045 respectively. The mean error of a single observation within these groups is also greatly reduced. Thus in Group 2 it is 0.180. It is evident that the cell volume does vary greatly from sample to sample.

It remains then to determine if possible the effect of these variations upon the cell sugar as calculated by the equation utilized by Titus and Willetts. It is assumed that the ratio, plasma volume : cell volume, is a constant for each individual for the duration of the experiment, and that variations from the constant value are due to variations in experimental procedure. Since the probable error calculations show each observation (ratio) to have an error of ± 0.534, there are possible then three calculations of cell sugar, i.e., the observed, the maximum, and the minimum. Sample 8 is used as an example. The plasma volume is 3.1 c.c., the cell volume 2.1 c.c., thus the ratio in this case is 1.476. The ratio may however be, 1.476, 1.476 plus 0.534, or 1.476 minus 0.534, i.e., 1.476, 2.010, or 0.942. Then where X equals plasma volume: $\frac{X}{\text{Total vol.} - X} = 2.010$ and $\frac{X}{\text{Total vol.} - X} = 0.942$. Solving for X, plasma volumes of the maximum and minimum possibilities are 3.4 and 2.5 c.c. Cell volume possibilities must then lie between 1.8 and 2.7 c.c. Substituting these values in the equation and solving the maximum and minimum cell sugars are 0.1371 and 0.1019. The value obtained by calculation from the observed volume readings is 0.1207.

Other examples were obtained by use of Samples 3 and 11. The three sugar values for Sample 3 are minimum 0.041, observed 0.045, and maximum 0.053, and for Sample 11, the values are 0.061, 0.069, and 0.074 respectively.

CONCLUSION

The variations in the reported sugar values for cell and plasma cannot be accounted for by alteration in cell volume due to the use of varying amounts of salt anticoagulant provided the cell existence as a suspended particle is maintained.

THE CLASSIFICATION OF THE TOXEMIAS OF PREGNANCY*

By Philip F. Williams, M.D., Philadelphia, Pa.

THE etiology of eclampsia and the associated toxemias of pregnancy still remain obscure. The advances in clinical laboratory methods, serology and biochemistry have been brought to bear upon the problem from many angles but with no definite results in so far as the causative agent or toxin is concerned. And so with the cause as obscure as ever treatment for the most part has remained symptomatic, although attempts have been made to treat the condition on the basis of biochemical findings. While treatment, such as the glucose injections for hypoglycemia, would appear rational, yet it cannot be admitted freely that we are not treating conditions resulting from rather than the cause of eclampsia.

The radical surgical method of treatment, hysterotomy, is based upon the assumption that the fetus and the placenta are the cause; once these are removed the toxemia would be relieved. The more conservative type of treatment by sedatives, narcotics and gland extracts, seems from statistics to be accompanied by a lower fetal and maternal mortality than the radical measures. However, upon reviewing collected statistics regarding the results of the various methods of treatment of the toxemias of pregnancy, one finds that there is a marked difference in the manner in which tables are made up. This may not be involved in the number of fetal and maternal deaths recorded but rather in the classification of the various types of toxemia recorded as encountered in different clinics.

And since we, as a Society, propose in the near future to review collectively the statistics regarding the incidence, severity, therapeusis and other points of interest regarding the toxemias of pregnancy occurring in our practice during the year 1928, I have felt that a discussion of the classification of the toxemias of late pregnancy might not be amiss.

Historically we find that a differentiation of the etiologic factors of the toxemias of late pregnancy has long been recognized. Playfair's *System of Midwifery*, 1876, has much to say regarding the albuminuria of chronic nephritis in pregnancy as well as albuminuria of pregnancy which might or might not be followed by convulsions. Hirst in his first edition, 1898, refers to the kidney of pregnancy, true nephritis present before pregnancy began, and eclampsia. In 1900 he added to this group the toxemias of pregnancy or autointoxication, and in 1912, eclampsia without convulsions. Williams in his first edition listed eclampsia, kidney of pregnancy, nephritis, toxemias of pregnancy and albuminuria. In 1908 he added preeclamptic toxemia, and in 1912 the presumable toxemias and combined the

*Read at a meeting of the Obstetrical Society of Philadelphia, October 4, 1928.

kidney of pregnancy and nephritis under nephritic toxemias. These divisions hold true in his latest edition, although he has more recently made another classification based upon the blood chemistry studies of Stander and Peckham.

Corwin and Herrick commenting upon the studies made at the Sloane Hospital for Women group these conditions into acute (eclamptic) toxemia; subacute or hypertensive toxemia; nephritic toxemia, acute renal disease, chronic renal disease. In another paper, using leading clinical features as a basis of classification, they consider three clinical types as well defined: acute convulsive or eclamptic toxemia, nephritic toxemia, hypertensive or cardiovascular toxemia. Cases in the last group have hypertension without convulsions, without nitrogen retention, or marked or prolonged albuminuria. They are often probably identical with essential hypertension or hypertensive cardiovascular disease. While closely related to nephritic toxemia the difference in their course and prognosis is sufficient to make their separation desirable on clinical grounds. Miller and Martinez, whose results in the treatment of toxemias with liver extracts have been surprisingly favorable, although no explanation of the pharmocologic action of the agent is offered, divide the toxemias into hepatic and nephritic and again as preeclampsia, mild (hepatic), moderate (mostly hepatic), severe (mostly nephritic), and eclampsia. There are certain things in favor of such a classification when one considers the clinical descriptions given for each group.

Two English monographs on the toxemias of pregnancy adopt different headings. De Wesselow and Wyatt consider acute yellow atrophy of the liver, eclampsia and preeclampsia. Cruikshank, Hewitt and Couper in their monograph adopt a clinical division, albuminuria, preeclamptic toxemia (albuminuria plus toxic symptoms), nephritic toxemia (chronic nephritis), eclampsia (convulsions). Zangemeister, who has done a great deal of research in eclampsia, in his 1927 textbook lists three subtitles, hydrops gravidarum, nephropathies and eclampsia. Levy-Solal, from a French clinic, speaks of renal, hepatic and anaphylactic eclampsia, the latter occurring in women who have no kidney or liver lesions. He is, however, somewhat hazy in describing the hepatic type.

Williams in summarizing the exhaustive work of his associates, Stander, Peckham and Plass, on the blood chemistry of the toxemia cases at the Johns Hopkins Hospital has evolved a new classification. He divides the toxemias of late pregnancy into eclampsia, preeclampsia, chronic nephritis, eclampsia superimposed upon chronic nephritis, and low reserve kidney. His observations on the clinical conduct of the cases, the blood chemistry and the follow-up studies have convinced him that but five per cent of all the late toxemias should be considered as preeclampsias and that the majority of cases formerly classed under this heading are in reality cases of low reserve kidney. This latter condition he feels is due to a lessening of the number of functioning glomeruli, congenital or acquired, and does not necessarily recur in succeeding pregnancies or lead to chronic nephritis; the blood pressure rarely exceeds 150 systolic and 90 diastolic; albuminuria is never very marked, and clinically the symptoms are not severe and subside quickly under treatment.

DeLee in his most recent edition roughly groups cases of toxemia into four types, hepatic eclampsism (eclampsism is almost synonymous with the term preeclampsia), nephritic eclampsia (acute nephritis with eclampsia), chronic nephritis (with or without eclampsism, this group includes the low reserve kidney), essential (?) hypertension (with or without eclampsism, which probably includes the cardiovascular group of Corwin and Herrick).

Through the literature on the toxemias of pregnancy in both textbook and journal one frequently finds references, often loosely made,

to the so-called hepatic type of toxemia. This term, modified at times to gastrohepatic, has served to cover many clinical varieties of toxemia. It has included acute yellow atrophy of the liver, whose clinical findings are well recognized and whose pathology is very definite, those cases of high blood pressure without change in the urine, low blood pressure with convulsions, those where some jaundice has entered the clinical picture or when some degree of liver autolysis or hemorrhage has been found at autopsy. Fairbairn very aptly remarks that the mere finding of a pathologic condition in the liver is insufficient evidence upon which to base the supposition that the cause of the eclampsia is hepatic, and as in no other hepatic condition do convulsions occur it may be assumed that the pathologic findings in this organ are not the cause of eclampsia. My own work in liver function studies during pregnancy with the two dyes, phenoltetrachlorphthalein and bromsulphthalein, using parallel Van den Bergh and icterus index tests leads me to agree with Cruickshank and his coworkers in their statement that there is as yet no very satisfactory means of evaluating the functional capacity of the liver during pregnancy. To this I must add a reservation regarding the estimation of the metabolic activity of the organ, so far as the glycogenic function is concerned. For the studies of the blood-sugar curve and glucose tolerance by Titus are so thoroughly convincing of a deficiency in this function of the liver that more attention must be accorded to this work.

When one compares the various classifications, it is apparent that the nephritic, especially the chronic nephritic toxemia, has long been differentiated from the more acutely developing convulsive toxemia of late pregnancy. In a paper read before this Society in May, 1914, Dr. Farr and I were able to show in a small series of cases the fact that a persistent retention of the total nonprotein nitrogen and urea nitrogen occurred in the puerperium in the cases of chronic renal disease complicating pregnancy toxemia as compared with a more rapid return to the normal in these fractions in the acute convulsive eclampsias. Other points of differentiation in many of the groups are not particularly clear. It is difficult to place cases of the hypertensive toxemia of Corwin and Herrick in many of the other classifications, unless under chronic nephritic toxemia. Yet, as they point out, there are many and sufficient points of differentiation both during pregnancy and at follow-up examinations to warrant a complete separation of the two groups.

Similarly it is difficult at times to classify, unless under such heading as presumable toxemias, such evident toxemic conditions as the anemias of pregnancy which simulate pernicious anemia, the chorea of pregnancy, the various skin manifestations, the neuritic syndromes, the occasional nontraumatic premature separation of the placenta with

toxic autolysis of the uterine muscle, the repeated stillbirths in non-syphilitic, nonnephritic women and other low grade apparently toxic conditions of obscure origin.

In one of the largest presentations of figures on toxemias of pregnancy yet made, that presented before the British Congress in 1922, the Sub-Committee under Dr. Eden prepared a table of symptoms according to which cases of eclampsia, of whatever origin, were graded as mild and severe. A case presenting any two of the following findings was classed as severe, all others mild: coma, pulse over 120, temperature 103° F. or over, more than ten convulsions, urine boiling solid, edema universal in extent, blood pressure over 200 systolic. This is a rather drastic manner of separating cases, but it must be admitted that it quickly groups the cases for determining the efficiency of any particular method of therapy. It might be well to consider the adoption of this scheme for our purpose.

The immediate final diagnosis, as Stander and Peckham suggest, should be deferred as late as possible in the puerperium, and in doubtful cases a thorough clinical and chemical investigation of the case should be made again six weeks after delivery. The ultimate diagnosis and prognosis, as Corwin and Herrick have shown, may have to be deferred until after long periods of follow-up studies, possibly through succeeding pregnancies, to determine the lasting changes which may have been incurred by the various organs.

And so if the Society proposes to gather and report the cases of toxemia for 1928, it might be well to select from these types, groups and divisions, a certain tentative number, which will be found practical for the purpose of ascertaining the incidence and severity of the cases, the differential findings from the laboratory studies, the fetal and maternal mortality, and the result of the various forms of therapy. This should be carried out not only for the present work, but also eventually for a furtherance of research in such cases, an interest in their follow-up examinations, and a stimulus to a greater degree of prenatal observation in order to reduce further maternal and fetal mortality and morbidity.

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BLOOD-PRESSURE READINGS IN 1000 PREGNANT WOMEN

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THIS study of the blood pressure in 1000 pregnant cases was made because it was believed that the readings given in various text-books and in the literature were somewhat too high.

In choosing these patients for study the following postulations were laid down:

> First.—The patient must have been under care at least one month before delivery, so that several blood-pressure readings could be taken.
>
> Second.—The patient must have been delivered of a viable child or, if she was delivered of a stillborn fetus, it must have been at least seven months old. This ruled out all abortion cases.
>
> Third.—The cases must be consecutive.

The blood pressure readings have been made by the auscultatory method with a mercury sphygmomanometer of standard make; occasionally they have been made with an aneroid machine. They have been taken either by me, the medical assistant, or by the nurse, the last named being well trained in taking the readings. I, personally, confirmed the reading in any doubtful case. The readings were made in the majority of instances with the patient in a sitting posture with the arm resting on the table. The highest was used wherever more than one reading appeared in a month.

Two diastolic readings are given, the first being the point at which the character of the sound changes to a lower pitch (fourth phase) and the second where the sound entirely disappears (fifth phase). The second reading is more reliable than the first except in some heart cases where the sound does not disappear entirely. The personal equation in distinguishing variations in intensity and in pitch of sounds is greater than that of determining the point where the sound disappears. Both readings have been taken in a great many cases and the graphs show that there is a parallel change in the two readings in the various months. The difference on the average is close to six points. Since this reading parallels the other more difficult reading to take and since it increases the pulse pressure but little, I have of late stopped recording the first diastolic reading.

In order to study the blood pressure in pregnant women more carefully all cases have been divided into three groups: First, those with blood pressures up to 129 (584 cases); second, those between 130 and 139 (240 cases); and third, those with blood pressures over 140 (176 cases). Any patient showing a reading one or more times above 129, was placed in one of the last two groups. I believe that this grouping

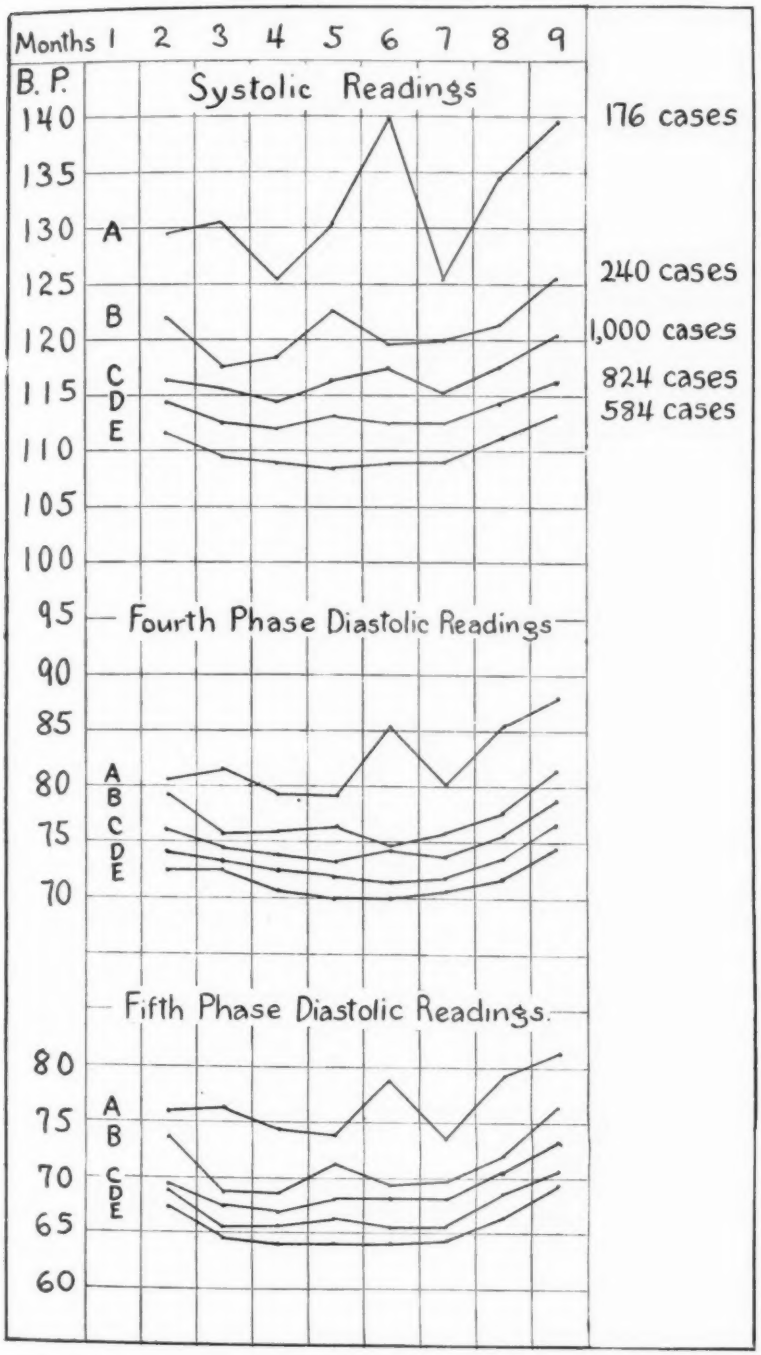

Fig. 1.—The graph represents the readings taken during the various months of pregnancy. The letters on the left indicate the corresponding graphs. The systolic and diastolic readings conform, i.e., when the systolic blood pressure increases or decreases, the diastolic conforms.

is justifiable. The first two groups were then added together and the mean readings were obtained and finally all three groups were taken together and averaged. A grand total of 5417 readings have been studied.

In the past few years I have come to believe that, with few exceptions, a patient with a blood pressure consistently above 130 demands more careful watching than one ordinarily gives the average pregnant woman. Starling and DeSnoo both agree with this statement. Most authors stress blood pressures of 140 to 150 as being the point where careful watching is necessary to prevent severe toxemias. The development of abruptio placentae several years ago in a case with blood pressure ranging between 130 and 139, focused attention on this point.

In the group ranging from 140 up, there were 90 patients whose blood pressures ranged between 140 and 149. About 20 per cent of these had high blood pressure once only. In nearly all of these, however, the diastolic reading was above the average for normal patients. Hence, I have concluded that repeated diastolic readings above the average in an otherwise normal patient is a silent signal for more watchfulness on the part of the obstetrician. These patients not infrequently show a heavy trace of albumin and at times an occasional cast.

There were 62 patients whose blood pressures ranged between 150 and 159. Adding these two groups together we have a total of 152 patients, or 86.36 per cent of the total, in this group. All of these patients were put on restricted diet and rest, and a few were hospitalized. Many in group two had their pregnancies interrupted. Of the remaining 24 patients, 12 had a blood pressure ranging between 160 and 169, 6 from 170 to 179, 3 from 180 to 189 and one each in the next 10 point increase. These patients were very sick as a rule and yet, fortunately, none developed convulsions.

There were 240 patients in the group with systolic blood pressure 130 to 139. There were many who showed this reading only on the first visit. I have felt that the excitement of making the first visit to the physician could easily account for the increase in view of the fact that a reading taken a week later was below 130. The subsequent readings, in most of these patients, have been normal. In Chicago systolic readings taken the last days of April and September and the first days of May and October not infrequently are increased. I have attributed the cause at these times to the fact that the patients were either moving from one apartment to another or having their homes painted and decorated. These readings are usually only temporary but occasionally they remain and the patient develops a true toxemia. The diastolic readings in patients with a temporarily increased systolic blood pressure were not increased. In the remainder of the group the diastolic reading is increased and consistently so.

Faught states that "individuals not infrequently show marked abnormal variations in the systolic pressure, the occurrence of which does not necessarily indicate impending grave metabolic disturbance or toxic states." This is true only if the variation is not persistent.

In the group with systolic readings below 129 there were 27 cases with a systolic reading of 100 or less throughout pregnancy. One patient whose systolic reading never went above 90 gave one reading of 76-60-54. In none of these patients was there any sign whatever of shock during or after labor. One patient delivered in the seventh month. Lynch and Schulze have warned against shock in low blood pressure cases. I have endeavored to combat the hypotension in these patients by the use of digitalis, diet, rest and graduated exercise, but I have failed in most instances to change the readings much. A few patients have been placed under the direction of internists with the same result. Roig, on the other hand, claims good results with digitalis. I have noticed that the blood pressure readings in the first three months of pregnancy are usually very low in many of those who suffer with more or less continuous nausea and vomiting. As a rule it rapidly rises as soon as the patient begins to feel better and to eat.

Ten years ago Roig stated that the readings in normal women and normal pregnant women were the same, i.e., 90 to 110. This is not in accord with my findings, only 0.27 per cent of the patients having a blood pressure of 100 or less.

In the discussion of Faught's paper, Norris said that 80 per cent of the women showed a blood pressure 100-130, the larger number being nearer 100. I found that 58.4 per cent had a blood pressure of 129 or less.

In 1925 Simons and Rassmussen stated that the blood pressure in the second month averaged 107.1 and gradually increased to 119 in the ninth month. They also stated that it decreased in the fifth and sixth months. A study of my graph shows a high blood pressure in the second month, ranging from 111.467 in cases with systolic pressures below 129 to 116.453 for all cases. In the former group the decrease was noted from the third to the fifth months, the lowest being in the fifth month, 108.744. When all cases are included in the average, the drop is noted only in the third and fourth months. It will be noted that there is a drop of only one point for each month. In all groups there is a gradual rise in blood pressure beginning at the seventh month and reaching its maximum at the ninth month. In the group below 129 systolic the difference between the maximum is only 4.4 while in the group 140 plus it is nearly 15.

I believed that there might be a difference in the tendency of the multiparous woman to develop an increase in blood pressure over the primiparous. This is tabulated herewith.

Para	1	2	3	4	5	6	7	8	10	11	12
140 +	66	58	32	8	6	3	2	1			
130 - 139	118	73	27	16	3	2	1				
0 - 129	255	179	88	36	10	7	5	1	1	1	1
Totals	439	310	149	60	19	12	8	2	1	1	1

BLOOD PRESSURE VALUES	NO. READINGS	SYSTOLIC AVERAGE	NO. READINGS	DIASTOLIC AVERAGE	NO. READINGS	SECOND DIASTOLIC AVERAGE
		SECOND MONTH				
0 to 129	109	111.467	101	72.059	109	67.082
130 - 139	48	121.208	43	74.488	48	73.125
140 +	24	129.583	19	81.263	24	75.750
0 to 139	157	114.445	144	74.279	157	68.929
All cases	181	116.453	163	75.092	181	69.834
		THIRD MONTH				
0 to 129	208	109.644	181	72.121	208	64.048
130 - 139	100	117.600	83	75.445	100	68.620
140 +	62	131.193	56	82.214	62	76.290
0 to 139	308	112.227	264	73.166	308	65.532
All cases	370	115.405	320	74.750	370	67.335
		FOURTH MONTH				
0 to 129	323	109.164	275	70.647	323	64.247
130 - 139	151	118.251	123	75.821	151	68.569
140 +	102	125.941	89	79.078	102	74.039
0 to 139	474	112.059	398	72.246	474	65.624
All cases	576	114.517	487	73.494	576	67.114
		FIFTH MONTH				
0 to 129	395	108.744	338	69.928	395	63.969
130 - 139	177	123.638	148	76.364	177	71.525
140 +	127	130.204	116	79.534	127	74.188
0 to 139	572	113.353	486	71.888	572	66.307
All cases	699	116.414	602	73.362	699	67.739
		SIXTH MONTH				
0 to 129	466	109.364	398	70.060	466	63.858
130 - 139	197	119.421	162	74.123	197	69.157
140 +	152	139.289	138	86.768	152	78.407
0 to 139	663	112.352	560	71.235	663	65.432
All cases	815	117.376	698	74.306	815	67.852
		SEVENTH MONTH				
0 to 129	515	109.611	441	70.725	515	64.291
130 - 139	216	119.916	179	75.631	216	69.731
140 +	165	126.315	151	80.105	165	73.442
0 to 139	731	112.656	620	72.142	731	65.898
All cases	896	115.171	771	73.701	896	67.287
		EIGHTH MONTH				
0 to 129	540	111.248*	460	72.152	540	66.448
130 - 139	225	121.404	187	77.614	225	72.142
140 +	169	134.603	143	88.482	169	79.242
0 to 139	765	114.235	647	73.731	765	68.151
All cases	934	117.920	790	75.858	934	70.158
		NINTH MONTH				
0 to 129	559	113.168	489	75.443	558	68.931
130 - 139	221	125.339	194	81.783	221	76.678
140 +	166	137.349	150	88.186	166	79.819
0 to 139	780	116.618	683	76.805	779	71.129
All cases	946	120.255	833	78.614	945	72.656

The percentage of multipara (62.5 per cent) in the 140 group is higher than any of the other groups. If we include all cases with blood pressures of 130, the percentage is slightly lower (55.77 per cent). If all cases are included, the percentage of multiparae is 56.1 per cent.

SUMMARY

1. The blood pressure readings in one thousand consecutive pregnant cases have been studied.

2. The patients have been divided into 3 groups:

A, those with systolic pressure below 129,
B, those between 130 and 139, and
C, those above 140.

3. In Group A the blood pressure throughout pregnancy is lower than in normal nonpregnant women. There is practically no change in the average readings from one month to another, the minimum being 108.744 and the maximum 113.148.

4. In Group B appear the potentially toxic cases. These patients demand more attention than is usually given them, since a certain percentage will prove to be toxic.

5. In Group C are seen the toxic patients. In the series studied there was no case of eclampsia.

6. There is only an average difference of 6 points in the diastolic readings taken in the fourth and fifth phases. The latter reading is more accurate and should therefore replace the fourth phase reading in recording the diastolic pressure.

7. The average readings in all cases have been somewhat lower than is usually recorded. This is not an accurate gauge since a rather high percentage of patients have a blood pressure of 140 +.

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ON THE OCCURRENCE OF OVARIAN AND ANTERIOR PITUITARY HORMONES IN THE URINE OF PREGNANT WOMEN*

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MANY attempts have been made to ascertain the function and to isolate the active principles of the endocrine glands. Thus far, the functions of the thyroid, parathyroid, pancreas, and ovary are definitely established. The posterior lobe of the pituitary gland produces an oxytocic principle which has no hormonal influence. The anterior lobe of the pituitary gland stimulates ovarian growth. In young dogs, complete removal of the anterior lobe or of the entire gland produces a cessation of growth, infantilism of the genitalia, and characteristic distribution of fat (Aschner,[1] thus supporting the claims of Goetsch,[2] and of Zondek and Aschheim[3] that the anterior pituitary hormone exerts a powerful influence on the ovary). Implants of the gland in infantile white mice, upon whom a unilateral oophorectomy is performed as a control, produce in four days maturation of graafian follicles and corpora lutea in the remaining ovary. (Figs. 1 and 2.) The uteri and vaginae in these mice show the characteristic changes of estrus. With the aid of an expert biochemist, we are now experimenting along these lines in our laboratory in the hope of finding a potent extract of the anterior hypophysis. The interrelation of the various internal secretory glands and their influence on the reproductive organs is thus made apparent.

As gynecologists, we are mainly concerned with the functions of the ovary, as this is of paramount importance in the primary development of the female sex organs and their function.

The graafian follicle and its successor, the corpus luteum, are the sources of the hormones which inaugurate puberty and continue the menstrual cycle until the advent of the menopause. The follicular hormone prepares the uterus for the menstrual act. The corpus luteum continues and increases the hormonal action inaugurated by the maturing graafian follicle, preparing it for the reception of a fertilized ovum (decidua menstrualis). This cooperative action of the early corpus luteum was demonstrated by Frank,[4] Allen,[5] and their coworkers, who extracted a substance capable of producing estrus in spayed animals. The corpus luteum is evidently producing another

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hormone which is, to a certain extent, antagonistic to the female sex hormone described above. It is termed by Papanicolaou[6] "luteal hormone," and its function is to suppress further maturation of graafian follicles during the periods of physiologic amenorrhea between puberty and the menopause. He was able to suppress ovulation indefinitely in the guinea pig by giving weekly injections of this substance.

Independently and almost simultaneously, Loewe[7] and Frank[8] demonstrated the presence of female sex hormone in the human circulating blood during the ten days preceding the onset of the menstrual flow and in pregnant women after placentation. This discovery is epoch-making in that it is the first demonstration of a true hormone in the blood.

With this brief reference to the function of the ovary and other glands which directly or indirectly influence its function, we shall

Fig. 1.—Control infantile ovary removed prior to implantation. Many primordial follicles, dense stroma, and very little vascularization.

proceed with the consideration of the ovarian and anterior pituitary hormones in the urine of pregnant women.

The need of an accurate test to differentiate early pregnancy, intrauterine or ectopic, from pathologic conditions that simulate the gravid state is generally recognized. Even advanced pregnancy is often confused with ovarian cyst or fibroids until the x-rays can demonstrate the fetal skeleton. We recently saw a case of early pregnancy mimic the symptoms of gastric ulcer to such a degree that an exploratory laparotomy was performed. The regularity of her menstrual cycle misled the surgeon, though he took the precaution of making a vaginal examination. Temporary amenorrhea of unknown cause and the onset of menopause are often mistaken for early pregnancy.

In a previous communication[9] we reported the recovery of female sex hormone in the urine of 61 out of 67 pregnant women, some of them within one week of the first missed period. We also reported that, in a series of 142 control cases, 15 or 10 per cent yielded a

mildly positive reaction. With improvement in our technic and by disregarding very mild reactions, we have entirely eliminated this annoying source of error. But this rigid interpretation of the vaginal spread simultaneously reduced our positives in early pregnancy from 80 to 90 per cent. The advantage is that a positive result can be relied on as indicating the gravid state; a negative calls for further investigation.

It seems paradoxical that the hormone of the corpus luteum of early pregnancy should appear in the urine long before it can be demonstrated in the circulation. Moreover, it is rarely found in the urine of

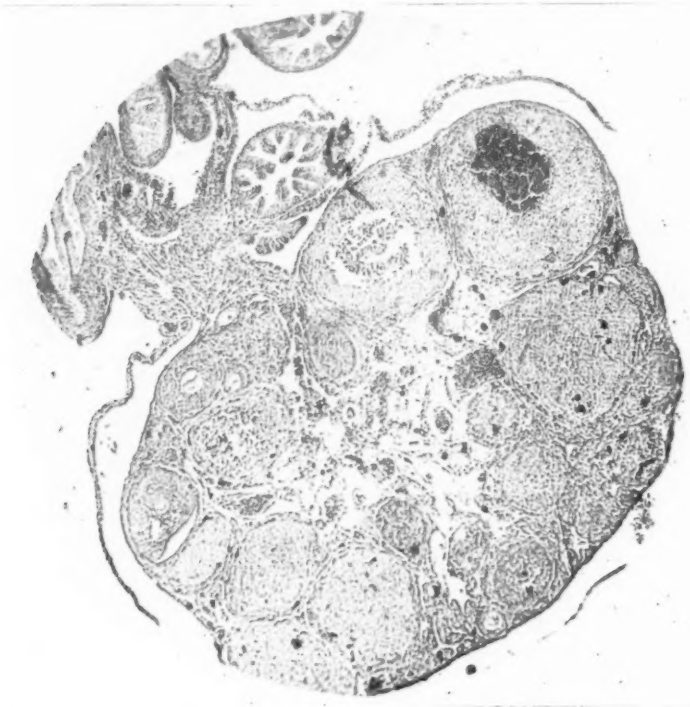

Fig. 2.—Second ovary removed ninety-six hours after implantation. Many corpora lutea, matured graafian follicles, considerable vascularization, and hemorrhage into one of the follicular cavities.

nonpregnant women, even during the last ten days of the menstrual cycle, when it is evident in the circulation in great concentration. The low threshold and increased renal permeability of early pregnancy permit the small quantity of ovarian hormone, then present in the circulating blood, to filter through, depleting it of the hormone to such an extent that 40 c.c. of blood do not yield even one mouse unit. Later, when placentation supplements the function of the corpus luteum of pregnancy, large quantities of sex hormone appear in the blood, apparently more than the kidneys can eliminate. Its presence

is then easily demonstrated in the blood and urine. We found the hormone in the urine of some women as late as five weeks postpartum; probably due to the persistence of the corpus luteum of pregnancy (Miller[10]).

To avoid repetition we shall not go into details of the technic employed in this work. The succession of changes in cell types found in the vaginal lumen of white mice during the estrual cycle, noted by Allen and Doisy,[7] and others, forms the basis of this test. Two spayed adult animals are simultaneously injected with two c.c. of catheterized urine at reasonable intervals consecutively five times. Weak reactions are disregarded. A spread showing a preponderance of nonnucleated squamous epithelial cells and an absence of leucocytes is indicative of pregnancy. The failure of one of the two animals to react to the hormone stimulation may be due to atrophy of the vaginal mucosa incident to a prolonged interval between castration and the test.

TABLE I. SERIES II

URINE OF PREGNANT WOMEN	POSITIVE	NEGATIVE
The week after the first missed period	18	6
Second week after the first missed period	22	7
Third week after the first missed period	25	4
Fourth week after the first missed period	19	2
Fifth week after the first missed period	16	3
Third month of pregnancy	19	2
	119	24

TABLE II. SERIES II

URINE OF NONPREGNANT WOMEN	POSITIVE	NEGATIVE
During the various stages of the menstrual cycle	1	62
Menorrhagia and metrorrhagia	0	20
Amenorrhea due to endocrine dysfunction	0	14
Uterine fibroids	0	6
Acute pelvic inflammatory disease	1	9
Lactation period	0	15
	2	126

Advanced pregnancy rarely, if ever, yields a negative; the 20 per cent of failures are confined to cases of very early pregnancy.

Aschheim and Zondek[11] recently reported on the diagnosis of early pregnancy by the presence of anterior pituitary hormone in the urine. They employ small (maximum weight 9 gm.) immature white mice whose ovaries show maturation of graafian follicles and formation of corpora lutea through the stimulation of the hormone in 2 c.c. of morning urine. They maintain that this effect on the ovary, and the failure of 4 c.c. of the same urine to produce estrus in the adult castrated mouse, is positive proof that the hormone in the urine is pituitary and not ovarian.

The fact is that a larger quantity of urine (6 to 7 c.c.) obtained from women during early pregnancy yields 80 per cent positive reactions in spayed animals and that advanced pregnancy rarely fails to show a positive test. This, however, does not contradict the hypothesis formulated by these investigators that the hormone which activates the immature ovary is derived from the anterior pituitary gland and that the response of the infantile uterus and vagina is, in a large measure, due to indirect stimulation by this hormone through the ovary. It is a matter of common knowledge that female sex hormone does not within three or four days materially influence the function and structure of the immature ovary, though it is capable of initiating puberty (Frank and Rosenbloom,[4] Allen and Doisy[12]) in the course of ten or more days. We are now routinely performing both tests simultaneously, but we are not yet prepared to render an opinion as to their relative value.

Thus, we have two biologic tests for pregnancy through the hormone content of the urine. In one we employ adult spayed mice, depending on the female sex hormone to reproduce estrus; in the other test, noncastrated infantile mice are employed upon whom apparently another hormone, presumably the anterior pituitary, exerts its influence primarily on the ovary and through it on the uterus and vagina.

This paper would be incomplete without noting a third biologic test for pregnancy developed by Siddall,[13] who justly argues that the hormone which is responsible for the growth of the uterus in the pregnant woman should cause similar changes in the uterus of a nonpregnant test animal which received injections of her blood. He injects 5 c.c. of the blood serum in the course of five days, employing immature virgin animals. When estrus is evident, he divides the weight of the animal by the weight of the excised uterus and ovaries. A coefficient of 400 or less is indicative of pregnancy.

This finding seems to contradict the observations of Frank and Goldberger,[8] who fail to recover even one mouse unit of female sex hormone in 40 c.c. of the blood of pregnant women before placentation has taken place. Moreover, Siddall's negative findings in women during the premenstrual period, when there is considerable concentration of female sex hormone in the blood, is even more puzzling.

Is there another female sex hormone in the blood which the ether extraction of Frank and Goldberger[8] fails to recover? The future will tell. The future will also determine which of these three tests shall finally supply the great need of a reliable test for early pregnancy.

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THE INVESTIGATION OF THE RELATION OF SPERM MORPHOLOGY TO FERTILITY BY MEANS OF MICRODISSECTION*

By G. L. Moench, M.D., F.A.C.S., New York, N. Y.

WHEN I first described the interrelation of sperm morphology and fertility,[1] the question arose as to whether or not some of the sperm changes observed and pictured by me, might not be pure artefacts. Double sperm forms especially seemed to be regarded with much scepticism.

It was to determine just what influence external factors had on sperm morphology that various experiments including microdissection studies of the human spermatozoa were undertaken. Such experiments were especially necessary for our work since microdissection of the human sperm cells had never before been attempted. Through the courtesy of Dr. Robert Chambers we were allowed the use of his laboratory and one of his microdissection apparatus. Such an apparatus consists of a microscope and an attached stand with two uprights carrying two extremely delicate glass needles which can be moved in any direction by a number of micrometer screws. On the microscope stage a glass chamber is mounted. This is kept moist with normal saline solution. The cell to be examined is suspended in an extremely minute drop and the needles work from below so as not to be between the lens and the object.

We turned our attention first to the double forms, since it had been claimed that most of these were only apparent and not real. In no case, however, did the dissection of a double sperm cell prove it to be made up of two single and separate cells. The spermatozoa always proved to be attached to one another at one or more points, so that separation was impossible without injury to at least one of the cells. Even such cells as are shown in Fig. 1, *4* and Fig. 2, *A1* to *A4*, have been proved to be of significance, since they show definitely incomplete

*A detailed account of the purely experimental side of this subject will appear in an early number of the Biological Bulletin.

[1] *Moench:* Am. J. Obst. & Gynec. **13:** 334, March, 1927. Med. J. & Record, July 20, 1927. Med. Herald & Physiotherapist, March, 1928.

separation. This strengthens the previously expressed view that this type of cell indicates some disturbance of spermatogenesis.

That a cell with a bent body or middle piece (Fig. 1, *3* and Fig. 2, *C1* to *C3*) is not an artefact, but represents some inherent disturbance of this region of the spermatozoon, could also be definitely demonstrated by us, since we were able to straighten out such cells with the microdissection needles, and saw them assume their original deformity immediately upon release from the needles.

Cells as depicted in Fig. 1, *6* and *9*, were also investigated. This form of coiling of the tail had occasioned us some trouble in interpre-

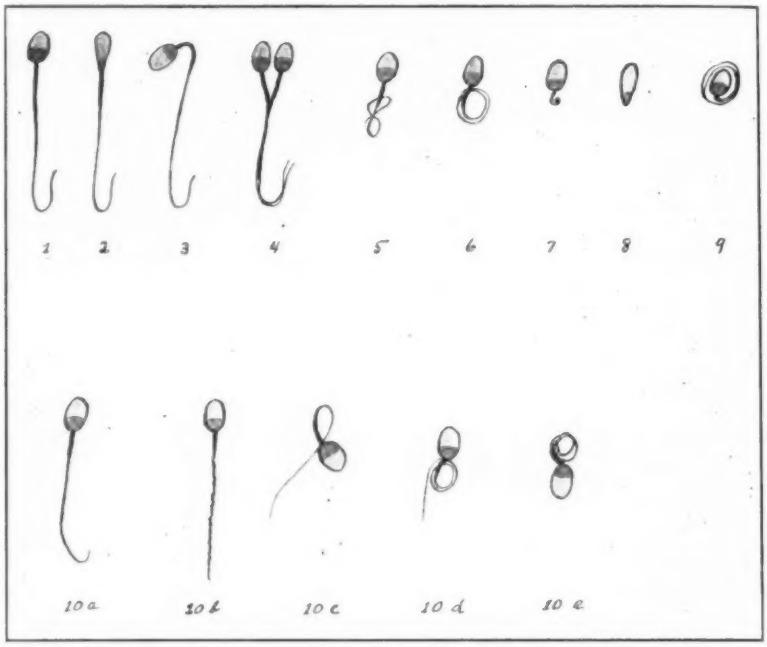

Fig. 1.—*1*, Normal human spermatozoon. *2*, Tapering spermatozoon head. *3*, Spermatozoon with bent body. *4*, Lack of complete separation of two spermatozoa. *5*, Spermatozoon with a coiled tail, pure artefact. *6*, Spermatozoon with a type of coiled tail which may be an artefact or may be an actual change in the cell. It is at any rate a late change and of relatively little significance with reference to spermatogenesis. Such cells have been seen motile, although their motility is of necessity limited. (See text.) *7*, Spermatozoon with coiled rudimentary tail. Such cells are useless as they have nothing with which to propel themselves. *8*, Tapering spermatozoon head with body and tail broken off. *9*, Spermatozoon head with body and tail coiled around the head. It is easy enough to see how this anomaly can be produced from *10e* by a simple folding over of the body and tail at the junction of the head and body. *10*, Coiling of the bodies and tails of the spermatozoa in distilled water. *a*, Normal spermatozoon in seminal fluid. *b*, Same cell a few seconds after it was pulled into distilled water by the microdissection needles. Tail fibrillating like frog's muscle in rigor mortis. At the same time this whole process of the coiling of the tail must not be considered as a dying reaction of the cell as motile cells of this type have been frequently seen. (See also text.) *c*, First whip-like lash of tail. *d*, Second convulsive jerk of tail. *e*, Third stage of reaction. Tail completely coiled.

tation in our studies of human fertility. The coiling did not seem to be purely artificial, since this type of sperm cell was usually motile in fresh semen specimens, and occurred sometimes with great frequency,

even in the semen of normally fertile men. Thus this malformation could not represent a fundamental disturbance of spermatogenesis, but rather only a late change. After many futile attempts to produce this form of coiling, by heating, centrifugation, slow drying, and various reagents, we at last succeeded by using distilled water. This is especially remarkable because distilled water otherwise produced no visible effect upon the sperm cells, and did not lead to any apparent change in the sperm head, while at the same time it caused both sperm body and tail to coil up in a half minute or less into a spiral as shown in Fig. 1, *10a* to *10c*.

It might be thought possible therefore that very abundant or watery vaginal secretion may also produce such a coiling of the sperm bodies

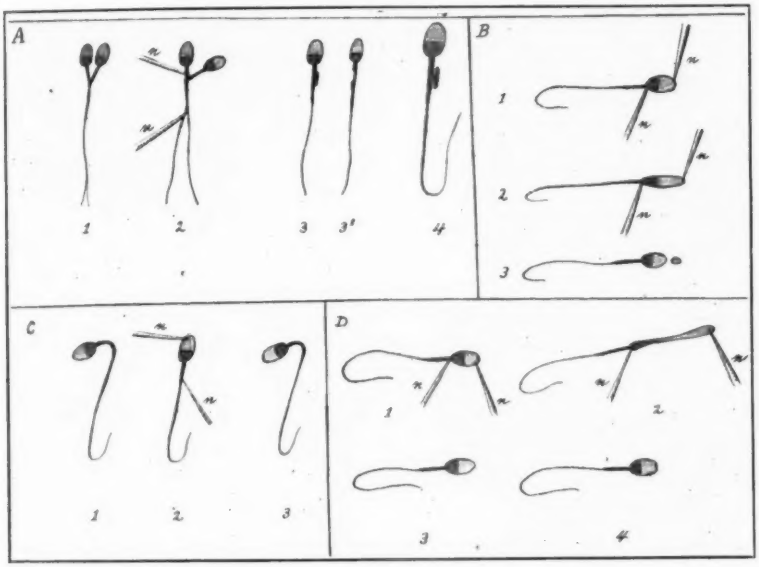

Fig. 2.—*A*, Microdissection of a double spermatozoon. *1*, Two spermatozoa closely attached to one another. *2*, Microdissection needles (*n* and *n*) separating the two spermatozoa. *3*, One spermatozoon completely separated from the other. (*3* and *3'*) *3* has a projection on its body and *3'* a depression where the two cells were torn apart. *4*, Represents *3* at a higher magnification.

B, Normal motile spermatozoon grasped by the two microdissection needles and still motile *1*. *2*, Spermatozoon stretched with the full tension of the needles. *3*, Small piece broken off at anterior end of the head, which in breaking released the cell from the pull of the needles, so that the sperm cell snapped back and assumed its original shape except for the torn anterior head end. The fragment torn off the head assumed spheroidal shape showing again the elasticity of this cell material.

C, *1*, Spermatozoon with bent body (motile). *2*, Same cell straightened out with the microdissection needles. *3*, Same cell after release from the needles.

D, Extreme elasticity of old spermatozoon shown. *1*, Three day old nonmotile spermatozoon, normal in appearance. *2*, Marked stretching of head by microdissection needles. *3*, Normal shape regained immediately on releasing the needles. *4*, Small piece of head broken off after several restretchings. Broken-out piece not to be located.

and tails with the result that conception would at least be made more difficult since these coiled spermatozoa have of necessity a more or less limited motion. I do not believe, however, that vaginal secretion actually will cause such a coiling of the sperm tails since we were not able

to produce this change on the sperm cells with vaginal secretion. Furthermore normal saline solution did not produce any coiling of the spermal tails despite the fact that normal saline solution has an hydrogen-ion concentration much nearer to that of the vaginal secretions than the hydrogen-ion concentration of distilled water.

Those sperm heads which had tapering heads (Fig. 1, *2* and *8*) were also interesting to dissect. In confirmation of the fact that such cell heads are often seen free without attached body or tail we found that the body of this type of cell could be broken off from the head by the micromanipulations more easily than in the normally shaped cell. Likewise the bodies of sperm cells kept for several days after emission broke off more easily than those of spermatozoa only two or three hours old. Perhaps this mechanical factor also has to be considered when explaining why spermatozoa retain their motility longer than their fertilizing power, since the tails may break off when such cells are called upon to overcome obstacles, for instance to penetrate the ovum.

An interesting and we believe hitherto unknown physical property of the sperm head was the elasticity which we discovered these cells to have. It is most marked in old, nonmotile cells (Fig. 2, *D1* to *D4*) but present to a certain degree also in perfectly fresh sperm cells. Even the sperm head of the live cell seems, as far as we have been able to determine, rather elastic. Fig. 2, *B1* and *B2*, for instance, represents a spermatozoon still actively motile, held by the two needles. This sperm head stretched as shown until a piece broke off the anterior portion of the head (*B3*) releasing it from the pull of the needles.

Under all the conditions tried, even in perfectly fresh semen, the sperm head was found to be tough and viscid, and even when cut with the needles, gave no evidence of any escape of nuclear material. It is worth noting that at times a tapering sperm head after being stretched did not always contract to its former shape, and it would seem in general that this type of sperm head has less elasticity than normally shaped heads.

It may perhaps appear to some that these experiments are but technical trivialities without any practical value. Nevertheless the experiments show that the sperm morphology previously described by me is really inherent and not due simply to external factors at work while preparing and staining the smears. Furthermore if we consider that Chambers[2] found the sperm cells of the cockroach very tough and impervious to injury after the animals had been starved for three weeks in a heated room, the subject immediately assumes a different aspect and we revert back again to the influence which the general physical health has on fertility, an influence which has been particularly stressed by me before.

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[2]*Chambers:* Science, 41: No. 1051, 290, Feb. 19, 1915.

THE CERVIX IN LABOR*

By Leon S. Loizeaux, M.D., F.A.C.S., New York, N. Y.

THIS study is based on a reading of recent literature and on 557 consecutive private cases personally observed at the Fifth Avenue Hospital. I desire to discuss mainly the problem of the cervix in difficult or prolonged labor, in which a nondilating, slowly dilating, or incompletely dilated cervix, is a major factor in the dystocia, though not necessarily the only major factor.

To define and limit our discussion, we will assume that cervical dystocia originates: (1) In cervical pathology per se; (2) in abnormalities of the forces whose function it is to accomplish cervical dilatation; (3) the nervous or psychic phenomena and their influence on the dilatation zone; and (4) a combination of any two or all three of the above factors.

A definite, though small percentage of cervical dystocias must be acknowledged as due to changes in the cervical tissues following chronic infections, trauma, trachelorrhaphies, caustics, improperly performed thermal cauterization, and other sources of scar tissue and general fibrosis. We believe the incidence of this type of dystocia to be relatively infrequent, because such cervices usually dilate when found in conjunction with normal presentation and position, and normal functioning of the dilating and expelling forces on intact water sacs. But this type of cervix is many times held responsible for nonprogressive dilatation when in reality primary inertia, irritable lower segment, or other abnormality of the dilating forces is the real, but unrecognized etiologic factor.

As to the forces concerned in the first stage, the only expulsive force is a general intrauterine pressure produced by uterine contraction and the only dilating parts are the lower segment and the cervix which, being passive, are the points of least resistance, through which the water sacs and later the fetus must pass. In the presence of unruptured membranes, this force is largely a fluid pressure, if the membranes have ruptured, the presenting part is substituted for the direct pressure of the dilating water bag.

Factors interfering with physiologic functioning of the expulsive forces of the uterus, are many, ranging from fibroid tumors to the overdistention from polyhydramnios, and from malposition to disproportion. A discussion of their influence would lead us far afield.

Abnormalities of the relationship between contraction and retrac-

*Read, by invitation, at a meeting of the New York Obstetrical Society, December 11, 1928.

tion, especially the persistence of lower segment tone between contractions, we believe to be a fundamental factor in a large percentage of cervical dystocias.

That nervous and psychic elements influence the dilating forces and prohibit or delay cervical dilatation, are well-established clinical facts. Generalized nervous tension, fear of pain, an exaggerated sensitiveness to pain and its subsequent psychic shock, or a more localized spasmophilia of the cervix and lower segment, due to a poorly understood nerve control, are all elements of profound importance in the nondilating cervix.

The controversy as to the existence or nonexistence of a truly spasmodic cervix and lower segment as a clinical entity, has not been settled.

Banister, in his recent book from the Queen Charlotte's Hospital, refers to spasm of the cervix (formerly described as rigid cervix.)

Fink, suggests the term spasmophilia of the dilatation zone, for the spasms which occur in the lower uterine segment and cervix and which produce dystocia.

Berkely and Bonney, and others, recognize spasmodic rigidity and organic rigidity as distinct types of cervical dystocia.

Mathieu and Schauffler, in a recent contribution, submit the proposition, that the major element in cervical dystocia is fibrosis, the result of trauma, inflammation, and infection. They attach little significance to such classifications as spasmodic or functional cervical resistance and doubt the existence of circular cervical muscle fibers of the sphincteric type. They state, "other things being equal, the ability of the cervix to dilate is directly proportionate to the amount of muscle and elastic tissue elements, as compared to the fibrous tissue content."

Greenhill, reports an interesting case, in which the cervix seemed to clamp down on the thigh of the fetus during the delivery of a cephalic presentation, causing distinct edema and circular marking by the closed cervix.

Whether the cervix has a distinct sphincteric action or not is debatable.

Toneff, and others, in advocating atropine and belladonna to relax a so-called spastic cervix, believe that the external os dilates as does the pupil under a mydriatic.

Sturmdorf flatly denies the existence of any continuous circular layer of cervical muscle fibers, and maintains that the fibers are disposed in a serried succession of oblique circle segments which widen the os like the iris diaphragm of a microscope.

Whether the cervix dilates and contracts by sphincteric action or anatomic conformity, is really of more academic than practical interest in actually dealing with cervical dystocia. We have all seen cases of varying degrees of dilatation close down during labor, as for instance after the expulsion of a number 4 bag, and cases losing part of attained dilatation under morphine as the effect of the drug wears off.

In two cases of conglutinatio orificii, in my experience, the dilatation seemed to be strikingly like sphincteric relaxation.

A combination of two or more factors is probably much more frequently the cause of cervical dystocia than any one factor acting independently. A pathologic cervix associated with primary inertia, in a nervous, tense, and fearful patient, is a combination not infrequent.

An anatomically normal cervix may fail to dilate in the presence of malposition with ruptured membranes and consequent incompetent upper segment contraction, or a tightly fitting head well engaged in the midplane, may by general impingement, cause an edematous, non-dilating cervix.

The diagnosis or early recognition of cervical dystocia is important to its successful management. First, the type of patient may give us the first hint as to how a cervix will act in labor; this type may be of the dystrophia, dystocia syndrome, as described by Greenhill and others, or the highly sensitive, fearful patient, generally below par, whose reaction to pain is severe, or whose impatient temperament makes her difficult to control.

The cervix in pregnancy may give us considerable forewarning, and there is a field for investigation and prophylactic treatment during pregnancy, of cervices that may cause dystocia during the first stage of labor.

J. F. McGrath in a study of 3000 consecutive cases from the Cornell Clinic, found cervical disease, either as an entity, or an associated condition, in 64 per cent. At the present time, in the prenatal clinic of the Fifth Avenue Hospital, we are making routine speculum cervical examinations, and carefully noting the pathology, in order to check up the subsequent labors as to cervical dystocia and also as to puerperal morbidity.

As yet we have not had the temerity to institute active treatment during pregnancy, excepting gentle cleansing and mildly antiseptic and astringent douches for cervical erosion and boroglyceride or iethyol and glycerin tampons to deplete edematous ulcerations, but I am not at all certain that active treatment should not be instituted at least in the ulcerated, infected and everted types of cervicitis and endocervicitis, even by the actual cautery, using the slow heat which is not so apt to cause bleeding.

Hofbauer's work, in demonstrating the presence of phagocytic tissue in the parametrium and base of the broad ligament, which appears during pregnancy and is intensified by the stress of long labor and especially by the existence of infection, explains to some extent the resistance of the cervix to infection during and following labor.

And while most of us believe that virulent infection occurring during labor and the puerperium, to be of extrinsic rather than intrinsic origin, we would much sooner approach a cervical maneuver in the absence of an acutely inflamed or chronically infected cervix.

A careful office vaginal examination a few days before the onset of labor, gives us helpful information as to the formation of the lower segment, malpositions, or distortions of the cervix, as well as the physical and nervous reaction of the patient to examination. The

dangers of such an examination properly performed have been exaggerated and the information thus elicited outweighs the alleged dangers.

The character of the onset of labor is frequently, if not generally prophetic of the entire clinical course of the first stage. Therefore we believe that the patient should reach the hospital as soon as possible after labor has started, and be under supervision and control. The early treatment of false labor pains, the beginning of true first-stage pains and primary uterine inertia, will prevent many severe dystocias.

The stage of cervical dilatation being essentially one of upper segment contraction and relaxation, it is important to observe the character of the pain and the tonicity of the uterus, both during and between contractions. Irregular, colicky pains, without painless relaxed intervals, especially if the pains are felt low down in front instead of the back, are symptomatic of nonprogressive dilatation and possibly of contraction or retraction ring dystocia.

The treatment of cervical dystocia should in reality be considered under three headings:

1. What should and can be done under ideal circumstances and surroundings, as regards hospital facilities, assistants, and competent anesthesia?

2. What we can advise the general practitioner to do, or do for him under conditions and environments not ideal or even safe, as to hospitalization, assistants, and anesthesia.

3. What we will endeavor to teach our students and interns, a large percentage of whom will do general practice, including obstetrics.

The least harm caused by a skillful enthusiast, is the harm he personally does to his patients. The greatest harm is in arousing enthusiasm for radical procedures for doubtful indications in ambitious, but inexperienced or incompetent practitioners, who do untold harm to both mother and baby, and then justify the procedure by quoting the skillful originator or advocate, of the method in question. This is equally true of the advocate of universal version, routine manual dilatation, induction of labor, and promiscuous cesarean section. It is indeed a delicate subject to discuss. But what is the effect upon our obstetric judgment of the knowledge we have of the limitations and the ability of the practitioner to whom we are giving advice.

Discussion on the above basis would more than consume our time. We will therefore assume as a basis of our treatment, hospitalization, competent anesthesia, and adequate nursing assistance to assure a thorough aseptic technic.

The accumulation of literature for, and against, incisional obstetrics is growing. Cesarean section by the lower abdominal route, the vaginal cesarean section, the multiple cervical incisions, and the vari-

ous episiotomies, have their proponents and antagonists in increasing numbers. There is a large group of "incisional antagonists," who in their radical conservatism are carrying the expectant treatment and their faith in nature's forces and the patient's endurance, to an opposite extreme.

The passing of methods and procedures once popular but proved unsound, has usually left some good points from experience in their use. The so-called twilight sleep gave us more definite knowledge of the effect of morphia and scopolamin on the fetus, and stimulated the development of safer first and second stage analgesia. The technic of version has improved, though the indications have not widened. Even the abandonment of pituitary extract before the baby is delivered, has taught us the dangers of forced uterine contractions to both mother and baby, and the value of this extract after delivery.

Reviere, in an excellent paper on anomalies of dilatation, states that the painful period between contraction is unnecessary, and is conditioned by the psychic state of the parturient. Experimenters are unanimous in considering that the various drugs used, morphine, chloral, urea derivatives, somnifen, pantopon, etc., have the property of reinforcing uterine contraction and accelerating the period of dilatation in hypertonic cases. Under their influence contractions become strong, complete, intermittent and the muscle is remarkably supple and relaxed between pains. If the dose is too large, or administered in cases of medium uterine tonus, it may suppress not only the pain, but the contraction also.

Meyer and Gottlieb state that morphine in small doses has rather a stimulant effect on the isolated organ (the uterus) and produces scarcely any paralysis in large doses. Barbour also observed an increase in tonus of the uterus in living animals. Although clinically, morphine has been observed to relieve crampy or colicky movements of the uterus, this must be due to an indirect effect produced by other effects of morphine. Scopolamin also produces an increase in uterine tone and hardly any paralysis.

Most writers agree that morphine has no distinct local action on the cervix, but acts by the alleviation of pain and spasm and the stimulation of uterine contraction. Clinically it is frequently observed to hasten progressive dilatation, sometimes unexpectedly and to a surprising degree. The dosage of morphine we believe to be an important factor in obtaining maximum results. Individual idiosyncrasy, the effect upon the fetus, as well as its effect in hastening or retarding labor, all indicate the initial small or tentative dose. One-quarter of a grain is usually too large a dose and will frequently stop all contractions and unless this is indicated, a smaller dose is advised. Moreover morphine should not be used before labor is definitely established. We have used for several years $\frac{1}{8}$ grain in 2 c.c. of 25 per cent magnesium sulphate, with satisfactory results. Whether the magnesium

sulphate is synergistic in its action, or has an analgesic action of its own in addition to the morphine, may be open to debate. We have had no bad results in several hundred injections given intramuscularly. Morphine is borne well by the baby unless its respiratory apparatus is called upon to function soon after the administration. We try not to give morphine within two hours of delivery, believing that gas and oxygen, or ethylene, to be safer and more efficient analgesics in the second stage. Morphine in ampoule form is better standardized and more uniform in its action than the tablets which, from deterioration and crumbling, and incomplete dissolution, cast some doubt on the actual dose injected.

Sedatives and analgesics not only conserve nervous energy and protect against psychic shock, but also aid in the restraint of too powerful contractions, and especially in the premature bearing down efforts which exhaust the patient and accomplish nothing. Morphine gr. ¼ in the exhausted patient, will materially help in conjunction with glucose intravenously or subcutaneously, to prepare for operative delivery.

When, in spite of sedatives and analgesics, a properly supervised period of expectancy has been of no or little avail, and the margin of physical reserve of either mother or child approaches the danger zone, the question of active interference must be met. The factors involved at this stage include the general condition of mother and child, the presence of actual or potential infection, the degree of effacement, and dilatation as well as the character, feel, and dilatability of the cervix, and perhaps above all the obstetric maneuver which must follow dilatation to accomplish delivery. The need of haste must be considered, also all other factors bearing upon the problem either during dilatation or after dilatation has been accomplished.

Insufficient dilatation with a border line pelvis and possibility of an oversized fetus in an elderly primipara, presents a problem whose solution might be entirely different in an identical cervix in a young woman with no disproportion, as shown by the Mueller test and general pelvimetry. The method of dilatation of, incision of, or avoidance of delivery through the cervix must also be decided in reference to the contributing cause of dystocia or complication of labor which makes delivery imperative.

The partially dilated cervix in placenta previa, presents different and additional problems than the same cervix in dry labor with occipitoposterior position; the cervix in eclampsia presents a different problem than that in a nonprogressing breech presentation.

In general, I favor delivery at one operation, following an honest period of expectant and medicinal treatment. Whether this be by multiple cervical incision, by lower abdominal section, vaginal section, or completion of dilatation manually followed by version or forceps.

we believe the patient will suffer less from shock, infection, intrapartum and postpartum blood loss, if we can attain the maximum of effacement and dilatation with no mechanical or surgical procedure, and when the decision is made for active interference, proceed as for any major surgical undertaking with the utmost of aseptic technic, the best anesthesia, and the fullest equipment of surgical armamentaria. To regard the instrumental, incisional, or manipulative delivery of a labor case as anything short of a major surgical operation is a grave error.

To increase or complete cervical dilatation, there are of course several methods at our command. Accouchement forcé we recognize as history, instrumental dilatation we relegate to the past. Hydrostatic bags have a definite, though limited field, and the limit is growing narrower. Manual dilatation by the Harris method is a procedure we mention with reluctance, but still choose occasionally as the lesser of several evils in completing dilatation under deep anesthesia preparatory to forceps delivery, breech extraction, and occasionally podalic version, where delivery is imperative and the vaginal route is indicated. Finally cervical incisions have their place and, I believe, an increasing sphere in the management of cervical dystocia. This includes vaginal cesarean by the single anterior incision or anterior and posterior incisions, as well as the multiple or Dührssen incisions of the external os.

Multiple incisions of the cervix should be used more frequently, their employment should be limited to the effaced canal with well-formed lower segment in which the external os does not dilate. Our experience has been limited to three cases in this series in which the (Y) incisions were used at "10, 2 and 6 o'clock" and repaired with number 2 chromic catgut loosely tied. This procedure does not compete with vaginal cesarean section in an uneffaced cervix in cases between the fifth and eighth month of pregnancy.

In dismissing from consideration both accouchement forcé and instrumental dilatation, I do so because of our conviction that they have been discarded from modern obstetric practice for good and sufficient reason. As for the hydrostatic bag, I believe its use is becoming more and more infrequent because of its disadvantages, its limitations, and the greatly lessened number of inductions.

Dorman in 1922, writing in conjunction with Lyons on dry labors, summed up the frequency with which he had used bags, by saying, in his first 500 cases twenty years ago, he had used bags 85 times, while in his most recent 500 cases up to 1922, he had resorted to bags but 25 times.

Our experience has been quite similar in the series of cases reviewed for this paper. Bags were used but eight times, perhaps not often enough, but we do not induce labor for contracted pelvis, we rarely

induce labor for postmaturity, and usually section for placenta previa, and we treat the convulsive stage of toxemia conservatively. It seems to me that other disadvantages of the bag in labor are the time element, the increased danger of infection by an added surgical procedure and finally that it does little more than make the cervix dilatable or, in other words, prepare it for manual dilatation or multiple incision. In fact, it works against my belief in delivery at one operation, once the decision for active interference has been reached.

A few years ago, Reed in advocating bagging, claimed but two major disadvantages, (1) danger of infection, and (2) prematurity. He then proceeded to defend it on the grounds that in the modern hospital we do not have infections, and secondly, by their method of fetal mensuration the length of the child could be accurately ascertained and prematurity avoided. Inasmuch as both the premises were faulty, the procedure was not adopted to any great extent.

The indications for bags are becoming limited. We use a number 4 bag as a retractor in certain cases of vaginal cesarean section for placenta previa, or termination of pregnancy in preeclamptic toxemia or cardiac cases, before the eighth month, occasionally in breech cases, especially with forelying cord and unruptured membranes. We have had two such cases. We also believe it indicated in certain placenta previas plus vaginal packing in cases to be delivered by the vaginal route, and occasionally in primary inertia, if the internal os is obliterated, with or without vaginal packing.

Objection to bags in general is, that they depend on uterine contraction to accomplish dilatation, they are apt to cause lower segment tonicity and even contraction ring dystocia in the irritable uterus, and to accomplish nothing in the toxic uterus, because the toxic uterus, does not readily respond to irritation. They also displace the presenting part. Again, unless the number four bag is used and the membranes ruptured as soon as the bag is expelled, sufficient dilatation is not secured to be of real help, or the contractions cease and the cervix closes down to an appreciable degree. This does not always happen, but it is of frequent enough occurrence to merit consideration.

Version in cervical dystocia, with ruptured membranes, patient nearing exhaustion from an excessively long first stage, is quite another matter than a version of election, simply to eliminate the second stage. We subscribe to DeLee's statement; "that forceps are used too frequently by men incompetent to use them, and not frequently enough by men skilled in their use."

Having relegated accouchement forcé and mechanical dilatation to history, and having considered rather disparagingly hydrostatic bags and manual dilatation, and limited the field of vaginal cesarean sec-

tion and Dührssen incisions, what have we to offer in lieu of these procedures?

We wish simply to emphasize two methods of procedure, neither of which is new: 1. More careful attention to the management of the first stage of labor, keeping ever in mind the conservation of physical reserve and the prevention of psychic shock. To this end we urge physical rest and more general use of morphine, chloral, and other anodynes, and sedatives. We urge the prevention of physical exhaustion and acidotic shock, by more careful attention to the diet during labor, especially in the use of glucose in some form, and abundant fluids.

With improved technic in the performance of version, with a more definite understanding of the diagnosis and rotation of posterior positions, greater patience in the conservative management of breech presentation and toxic cases. We can do much and do it quickly, once cervical dilatation is attained.

2. We urge the more frequent resort to low cervical section in the cases where complete effacement is not attained and at least the more frequent consideration of multiple cervical incisions, where we have effacement but nondilatation of the external os. We particularly urge the more frequent consideration of cervical incisions in nondilatation of the external os with well thinned out lower segment and descent of the head, in the presence of scar tissue and rigidity.

In this series of cases showing 33 abdominal sections or one in 17 cases, we have no apology to offer for their frequency. In 14 of these sections, insufficient dilatation was a major consideration.

We have no plea to make for fewer cesarean sections, but do ask for more timely and better performed sections. We do not share the pessimism of many in regard to the trend of obstetrics toward incisional methods.

We must either train our younger generation of obstetricians in gynecologic and obstetric surgery, or train the general surgeon in obstetric judgment and teach him the lower segment technic.

In view of the lowered mortality of the lower abdominal approach, we must revamp the statement by Williams that the "mortality of cesarean section is in direct proportion to the number of hours the patient has been in labor." We believe low section is a safe and sane procedure after an adequate test of labor.

We must get further away from the idea that section must be performed only for an inadequate pelvis or some grave obstetric emergency, such as placenta previa centralis. We believe it should be more frequently considered in obstinate primary inertia, and persistent noneffacement of the cervical canal.

Fifteen years ago it was a rather general obstetric belief that the first baby in border line contraction should be delivered per vaginam,

even though the danger to the child was great, but we are gradually revising that impression because the average age of the primipara is increasing and because the low section will allow a more satisfactory test of labor.

In reviewing the histories of 557 consecutive private cases at the Fifth Avenue Hospital from January 1, 1923, to November 1, 1928, the following data are believed to be of interest. There were 310 primiparae, 247 multiparae, 533 vertex presentations, 19 breech presentations, 3 transverse, and 2 face presentations. There were 33 cesarean sections (23 low cervical, 10 classical), 4 vaginal cesareans, 3 Dührssen multiple incisions, 13 versions (5 cases in which dilatation was completed manually), and 15 cases with forceps at the inlet.

The average length of labor in the primiparae was 15.2 hours, in multiparae, 9.8 hours.

Of 310 primiparae 188 had morphia, 102 cases had no first stage analgesic, and 10 had other sedatives and analgesics than morphine, such as codeine, codeine and luminal suppositories, allonal, etc.

Of 247 multiparae, 69 had morphia, 178 no morphia. In 6 cases of placenta previa: one between 5 and 6 months was delivered by vaginal section, and three were delivered by abdominal cesarean section (1 classical and 2 lower segment); two by version.

One eclamptic at seven and one-half months, was delivered by vaginal section, likewise two cardiac cases between the fifth and sixth months.

Five cases in which toxemia was the major factor were sectioned by the abdominal route. Two of these cases had convulsions after operation, but no case was sectioned after the convulsive stage.

There was one maternal death, a postpartum eclamptic, in a multipara who delivered spontaneously and without an anesthetic.

There were 27 babies stillborn, or who died during their hospitalization period of two weeks postnatal; a gross mortality of 5 per cent. Subtracting five premature stillbirths weighing under three and one-half pounds, and four cases admitted to the hospital at full term with babies known to be dead, we have a corrected mortality of 3.2 per cent. Two babies died following operation for pylorie stenosis. One cleft palate baby died from aspiration pneumonia on the twelfth day. Four premature babies, two of them toxic, died during first week of the postnatal period.

There were seven stillbirths, however, which were the direct result of labor and its management, and six of these had directly to do with cervical dystocia.

In one case of placenta previa marginalis, eight months and one

week gestation, the baby was delivered too quickly by version, through a cervix seemingly sufficiently dilated but which was not.

One baby slightly premature, weighing over five pounds went, through a tumultous dry labor, with the cervix dilating slowly and contractions very strong and frequent. We feared the effect of morphine on the baby and allowed a slow spontaneous delivery, the baby dying in a few hours, from cerebral hemorrhage. This patient should have had rectal analgesia, or been delivered under inhalation ether by forceps.

One case, an easy version, in a multipara for nonrotating posterior position died suddenly twenty-four hours later, and autopsy showed a rupture of the liver.

Two cases of difficult forceps at the inlet were stillborn.

One case died on the fifth day during a direct transfusion for hemorrhagic disease of the newborn, but I have always believed it was cerebral injury, due to forceps in a case that should have been sectioned, and less than a year ago I delivered this patient by section of a normal baby, following a test of labor.

One patient, a primipara, thirty-one, a neglected case of primary inertia and disproportion, had been in labor nearly three days, had a simple flat pelvis, and overriding head. The baby was dead on admission to the hospital. The cervix was but two fingers' dilated, patient had intravenous glucose, low section followed by direct blood transfusion. The baby weighed eleven pounds, one ounce, the mother made an uneventful recovery excepting a severe reaction following the transfusion.

SUMMARY

The nondilating cervix is a major factor in dystocia and its management.

Expectant treatment combined with morphine and other analgesics is strongly recommended for the first stage of labor.

Ultraconservatism should be followed in, and limited to, the first stage.

Choice of the lower abdominal or vaginal route for the termination of labor should be made as early in labor as possible.

Delivery at one sitting is advocated when the decision for interference has been arrived at.

More frequent consideration of cervicolaparotomy, vaginal cesarean, and cervical incisions, rather than hydrostatic bags or manual dilatation.

The conservation of the patient's physical strength by adequate rest and diet, and obstetric intervention while there is still a wide margin of safety.

All deliveries, whether spontaneous, surgical, or manipulative, should be carried out with meticulous care as to hospitalization, anesthesia, assistants, and technic.

The trend toward incisional obstetrics is justified if practiced by qualified obstetric surgeons, endowed with the obstetric judgment essential to obstetric decisions as well as incisions.

4 East Eighty-Eighth Street.

(For discussion, see page 138.)

THE INFILTRATION OF THE CERVIX UTERI WITH MERCUROCHROME 220 SOLUBLE IN THE TREATMENT OF CERVICITIS AND ENDOCERVICITIS

By Frank Helvestine, Jr., M.D., and F. A. Farmer, M.D.,
Roanoke, Virginia

SINCE the time of its introduction, mercurochrome has been recommended as an antiseptic of value for infection of the genitourinary tract. Young and his co-workers[1] have been its chief advocates. From the Mayo Clinic, von Lachum and Hagar[2] claim excellent results in the treatment of specific endocervicitis from the use of mercurochrome alternating with silver preparations and iodine. They paint the vaginal vault with 1 per cent solution of the substance and introduce crystals into the cervical canal. Davis[3] uses a 3 per cent to a 5 per cent solution of mercurochrome as an adjunct to cautery treatment of endocervicitis. Brady[4, 5] in two recent articles advocates the topical application of a 20 per cent solution of mercurochrome to the cervical canal in the treatment of gonorrheal endocervicitis.

For the successful treatment of endocervicitis it is necessary for any form of therapy to penetrate to the base of the numerous cervical glands where the microorganisms causing the infection are harbored. The introduction of a medicinal substance into the cervical canal with the expectation that such a substance will reach the base of the infected glands when the excretory flow is always toward the cervical canal is illogical and accounts for the failure of the so-called medical treatment to alleviate the trouble in the vast majority of cases.

The method of treatment of endocervicitis which we have been using and wish herewith to describe is a rational one based on the anatomic pathology of the condition. Its purpose is to place at the base of the glands in contact with the bacteria causing the infection, a germicidal solution. The method gives comparatively quick results, the procedure is simple and requires no complicated or costly apparatus to carry out.

METHOD

The cervix is exposed through a bivalve speculum, painted with 2 per cent mercurochrome solution, grasped with a tenaculum to steady it, and the canal swabbed free of discharge. A 2 per cent aqueous solution of mercurochrome is injected into the tissue of the cervix at the four points of the compass and sometimes between these points. The needle for injection is inserted into the cervix parallel to the cervical canal at the border of the mucosa and stroma. This point is

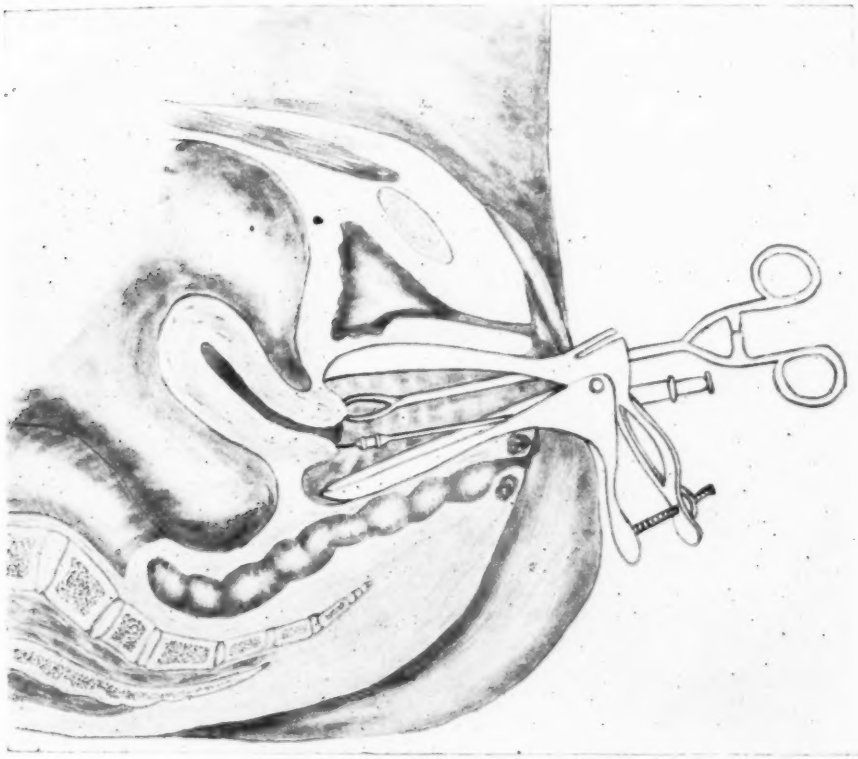

Fig. 1.—Diagrammatic drawing illustrating method of treatment.

plainly indicated by the consistency of the tissue and is approximately ½ cm. from the external os. A small Luer syringe with a metal or glass extension, as in throat work, and a ⅝ in. 25 gauge needle are used. A few drops of mercurochrome are injected at each puncture and injection is continued as the needle is withdrawn. This needle can be inserted its full length without danger of passing outside the uterus. Injection under too much pressure causes pain and it is only when the needle has been inserted into the stroma that much pressure is necessary for injection. From ½ to ¾ c.c. of mercurochrome is injected at one treatment. At subsequent treatments injections are made between

the points injected at former treatments. Our best results have been obtained with five- to seven-day intervals between treatments.

RESULTS

We have treated a total of thirty cases of inflammation of the cervix by the method just described. Of this number four cases were due to infection by the gonococcus and were seen at the beginning of the process with the organisms present in great numbers. These specific cases required an average of eighteen treatments before the gonococci completely disappeared.

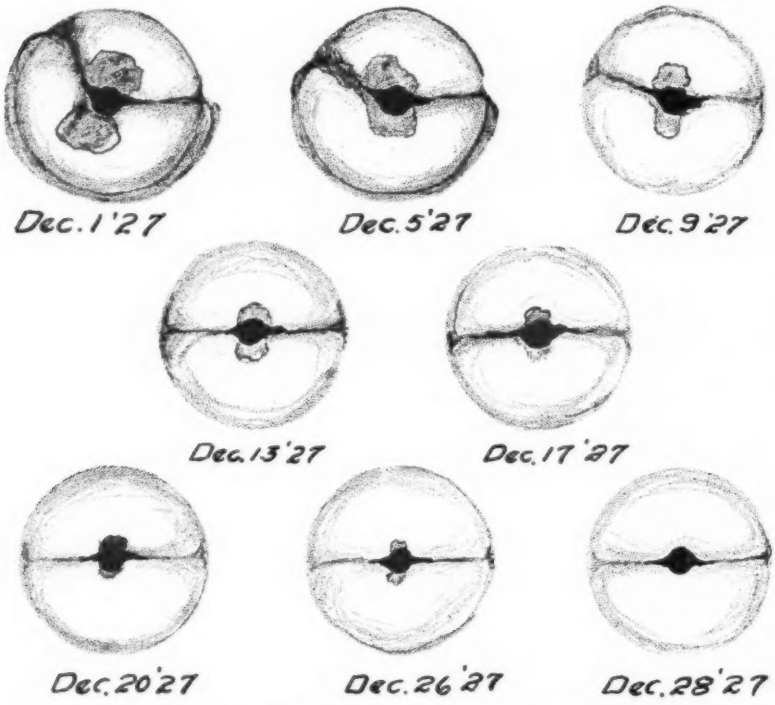

Fig. 2.—Eroded cervix in a multipara complicated by an extensive laceration and edema of the lower lip. Improvement under treatment.

Six, or 20 per cent of cases, were unmarried women, and the lesion was of the virginal type associated with a cervical erosion. In these cases the cervical discharge was thin and watery and caused marked irritation of the external genitalia. An average of six treatments caused a cessation of the discharge and a healing of the erosion in these cases.

In the remaining twenty cases treated all were married, and only three of the number had not borne children. An erosion associated with a leucorrhea was present in each of these three cases. These cases required an average of eight treatments. Of those who had borne

children there were six cases without cervical lacerations but all of which showed erosions with the exception of one case. These patients were treated on an average of six times to effect the desired results. The cervices of the remaining eleven cases all showed lacerations from trauma of labor and in each case there was an accompanying erosion. In four of these patients the uterus was retrodisplaced. Some of the lacerations were so extensive that the cases should have had operative treatment, but for various reasons the patients would not consent to this procedure and the infiltration method of treatment was used as second choice. This series of eleven cases required on the average nine treatments. The number of treatments required depended very much on the degree of pathology present and varied from five to fourteen. All cases were markedly improved; the edema, erosion, and leucorrhea disappeared.

DISCUSSION

The method of treatment that we have used is essentially that described by Gellhorn[6] in his monograph on "Nonoperative Gynecology." He used this method, however, in the treatment of specific infections only and injected a 1 per cent solution of methylene blue. We have treated nonspecific as well as specific cases by this method and feel that 2 per cent aqueous solution of mercurochrome has a greater antiseptic value and is less irritating to the tissues than methylene blue. In our series of cases there have been no evidences of sloughs, abscesses or other untoward effects noted. The pain caused by the injections if the needle is kept out of the stroma is negligible. The procedure is simple and requires no expensive apparatus in carrying out. As has been stated, the object of the method is to introduce a germicidal substance into the tissues at the base of the cervical glands where the organisms causing the infection are to be found.

The results are obtained relatively quickly and the number of treatments necessary to obtain a cure or degree of expected improvement varies directly with the extent of the pathology present. In the cervices with extensive lacerations, where operation is clearly the treatment of choice, edema, erosions, and leucorrhea disappear under the infiltration of the cervix with mercurochrome. A permanent cure cannot be expected. It is in the cervix without laceration that this method of treatment is indicated.

SUMMARY

1. The infiltration of the cervix with mercurochrome in the treatment of endocervicitis is a rational procedure which has as its purpose to place a germicidal substance at the base of the cervical glands where the infectious organisms are harbored.

2. The method is simple to carry out, requires no complicated or expensive apparatus, and in our hands has caused no untoward results.

The results are obtained relatively quickly and the number of treatments required varies directly with the extent of pathology present. Cases of specific infections do not respond to treatment as quickly as those of nonspecific infections.

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SHENANDOAH HOSPITAL.

COAGULATION DIATHERMY IN CERVICITIS, USING A NEW ELECTRODE, WITH AN ACCOUNT OF THE RESULTS IN 200 CASES

BY FRANK M. ENDE, M.D., NEW YORK, N. Y.

INNUMERABLE methods of treatment have been advocated for the treatment of chronic inflammatory conditions of the cervix. These have been represented as satisfactory in the vast majority, excepting perhaps the most advanced cases of cervicitis in which induration and cyst formation have invaded the entire cervical musculature. The procedures include hyperemia, antiseptic solutions, mild heat, destructive heat, and surgery. There are undoubtedly indications for each of these; but the good results attained after destruction of the pathologic endocervix by means of heat lead me to believe that the majority of cervices should be treated in this manner, barring of course the acute cases and those which obviously require surgery in order that the pathology be entirely eradicated.

CAUTERY LIMITATIONS

The cautery has been a favorite agent for this treatment since the publication of Dickinson's paper[1] but the destruction of tissue, out of sight high up in the cervical canal with any degree of accuracy is impossible by this method. The depth of tissue destruction depends upon the heat of the cautery and the duration of the application. The product of these factors gives us a rough idea of what we are accomplishing, but we have no way of accurately measuring the heat of our cautery and even the rough estimation of its temperature is very difficult without apparatus of a highly technical nature. Dull red heat, red heat, cherry red, and bright red are the terms used in describing the amount of power advocated. Most of these are used in treatment with no idea of the actual heat employed because the color of the cautery tip depends entirely upon the illumination of the room in which

it is used. A cautery turned to bright red in darkness looks dull red in daylight and cold in direct sunlight. A dull red tip has a temperature of approximately 1350° F. when viewed in darkness, and in daylight it requires a temperature of about 1600° F. to bring it to the same color. It is quite impossible to estimate this temperature and if it were, the quenching of the cautery by cervical mucus creates inequalities in heat along the hot surface which is very likely to result in an overdose at the external os and very little destruction about the internal os. This is true whether the tip is heated before introduction or the current turned on after the tip is in place. This fact is easily demonstrated if a cautery tip is slid across a wet surface in a darkened room.

It has long been my opinion that the cautery user, who reports many cures without a great number of strictures of the cervical canal, is an exceptional guesser. The heat is roughly estimated, and in few of the articles on this subject has any attempt been made to estimate time. Still these are the factors which cause destruction of tissue, and if either is disregarded, inaccuracy of dosage is the inevitable result. If the temperature and time could be accurately measured there would still be the quenching action of the mucus and the limiting action of carbonization to contend with and our effort to kill tissue to a predetermined depth would certainly fail because of these limitations.

The cautery can never compete with diathermy because the results of treatment will be as uncertain as the heat of the cautery tip, and this will always be an unknown factor in the equation.

DIATHERMY ADVANTAGES

When diathermy is chosen for the treatment of endocervicitis, we use energy which can be measured in milliamperes, and if we let it flow for a period of several seconds, we have used so many milliampere-seconds of power. This is a very definite quantity which will do a definite amount of useful work when passed through tissues; it is unaffected by quenching in the mucus of the cervical canal and it is not subject to the self-limiting action of charring and carbonization. In eliminating these we have progressed in the solution of the problem of giving a measured dose of destructive heat to the tissues of the cervix. We kill tissue to a measured depth, and our results take on uniformity.

It has been my practice in the past to use an indifferent electrode about 6 by 8 inches in size on the abdomen, working in the cervical canal with a small active electrode introducing it to the internal os and withdrawing so that strips of coagulation were produced extending along the canal to the external os. By this process the current was made to travel through a variable amount of tissue including skin, superficial fascia, deep fascia muscle, intestinal walls and contents and the resistance of these tissues effected the efficiency of the work done at

the cervix. This long current pathway in the patient of average size becomes much longer in the heavier patients and the thick layer of subcutaneous fat much more resistant, while the reverse is true in patients of a hundred pounds. This resulted in more destruction in a given period of time in slight individuals because the resistance of the pathway was low, while the heavier individuals received less coagulation in a given period of time because of their high resistances. Nothing can be done to compensate for this variation in resistance. The power of the machine or the duration of application might be varied but this effort would be but a random guess and the danger of overdose would still remain a most disturbing factor. The measurement of each patient's resistance would enable us to adjust the power to suit the resistance and give an accurate dose of diathermy, but this is not practicable because of the technical apparatus required for these measurements and the time required to make them.

Measurements were taken in fifty cases so that the magnitude and variability of this factor could be shown. The highest resistance between the abdominal skin and the cervical canal was 16,000 ohms, the lowest was 2,400 ohms, a difference of 13,600 ohms, and if they had both been treated with the machine set properly for an average individual, the first would have received an inadequate dose while the second would have been overtreated.

Realizing that the skin and superficial fascia were the chief factors in the production of this resistance, I decided that something should be done to eliminate them from the circuit, and shorten the pathway as much as possible. This can be accomplished if both electrodes are made active, and so reduced in size that they can lie in the cervical canal side by side, making contact with the mucous membrane from internal os to external os. The current in passing from one electrode to the other traverses but an eighth of an inch of tissue. (Fig. 1.) The resistance is negligible and is to all intents and purposes the same in all patients.

APPARATUS

The electrode which I have used in these cases (Figs. 2 and 3) consists of a handle carrying a tapered tip of insulating material along one side of which are placed two parallel wires which make contact with the endocervix along the side of the canal. It is graduated in quarters of an inch to permit the operator to measure the cervical canal by simply introducing it into the internal os and removing to see how far down it has been wet by the cervical mucus. The object of this procedure is the determination of the amount of tissue to be coagulated so that we may know how many seconds of exposure a given case should receive. As an example let us suppose that with a given setting of the machine we kill tissue to a depth of 2 mm. in four seconds, when one inch of these electrodes are contacting with tissue. If only one-half inch of the electrodes contact with tissue an exposure of but two seconds is

given so that coagulation will go 2 mm. deep as before. In the same manner it was an easy matter to adjust the duration of exposure to the length of the canal on a basis of *one second* per *quarter inch*.

The correct adjustment of the machine which was used in doing this work was ascertained by coagulating the cervical canal in cases of myoma in which total hysterectomy was contemplated and preserving the specimen for study to determine the depth of destruction. (Incidentally diathermy by this method is an ideal manner of sterilizing the cervical canal before performing a supravaginal hysterectomy.)

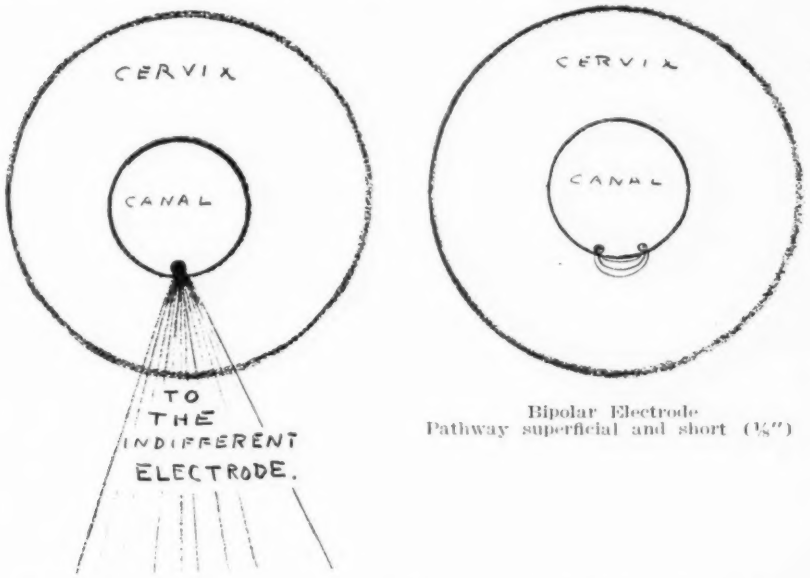

Fig. 1.—On the left is shown the direction of current flow when an indifferent electrode is used, while on the right the superficial short current pathway between the electrodes of the bipolar instrument is illustrated.

After each strip of coagulation was applied the tip was short-circuited by pressing a piece of steel wool or lead foil on both electrodes, and the foot switch was depressed so that the meter registered the output. When the examination of specimens was completed it was a simple matter to duplicate the dose of diathermy by again short-circuiting the tip with a piece of steel wool, turning the machine up to its previous output for the purpose of treating a new case. Then this problem arose: How can another machine be adjusted so that it will duplicate this performance? Unfortunately the voltages of the various machines on the market differ, and we cannot expect two machines to do the same amount of work though they are both adjusted to put out 1000 milliamperes. The meter only tells part of the truth.

SYSTEM OF DOSAGE

Obviously we must try the new machine on some substance which will coagulate at about the same rate as the cervix. For this purpose

I use egg albumen to which has been added chloretone. Four grains are added to the white of an average sized egg and this serves a double purpose. It reduces the resistance of the albumen so that it compares favorably with that of average cervical tissue and preserves it so that a test tube of the mixture may be kept for a long period without refrigeration.

The dummy tip shown in Fig. 4 is the electrical duplicate of the tip used for treatment, the electrodes and spacing being identical but the insulating material is cylindrical in form instead of tapering, so that a tight fit is maintained when the tip is pushed through the perforation

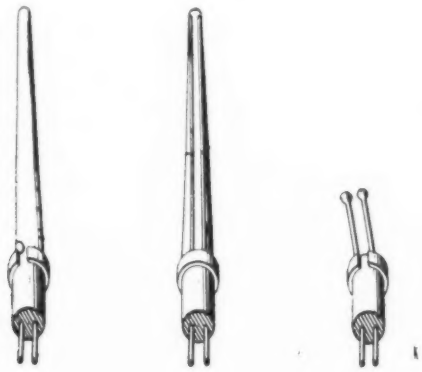

Fig. 2.—(*A*) Intracervical bipolar electrode turned to show the graduations. (*B*) Same electrode turned to show the metal elements which carry the current. (*C*) The erosion tip.

Fig. 3.—Tip in handle with leads attached and tip inserted. The cross-section of the tip shows metallic electrodes.

in the rubber stopper. The albumen is placed in a test tube and the stopper, with one inch of the electrodes exposed, is pushed into it. (Fig. 5.) The apparatus is tipped to immerse the electrodes and the current is turned on until an opaque white coagulum forms between them. (Fig. 6.) If this is accomplished in exactly four seconds we short-circuit the tip with steel wool (Fig. 7) and again depress the foot switch so that the meter reading may be recorded, thus obviating the necessity of using albumen each time a treatment is given. If the coagulation is not done in four seconds it is advisable to persist in the experiment until it is, so that doses may be computed on a basis of one second exposure for each quarter inch of cervical canal.

Let us assume that the meter reading was 1800 Ma. The operator may now administer a measured dose of destructive heat in a case of cervicitis without the danger of coagulating tissue deeper than 2 mm. He short-circuits the electrode tip and adjusts to 1800 Ma, measures the canal and gives an exposure of three seconds if it is three-quarters of an inch long, and five seconds if it is an inch and a quarter long.

PROCEDURE AND AFTER-TREATMENT

In none of the 200 consecutive cases treated in clinics and private practice was it necessary to use anesthesia. The procedure is practically painless and the majority describe the sensation as uncomfortable heat. Patients treated with the diathermy cautery estimate this discomfort

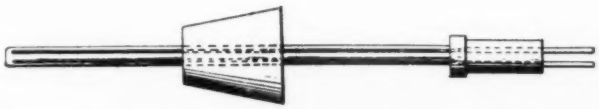

Fig. 4.—Dummy tip pushed through rubber stopper for measuring the machine's output in terms of coagulation albumen.

Fig. 5.—Method of coagulating albumen.

as much less painful than that with the actual cautery, and diathermy has cured these cautery failures. Even diathermy coagulation by the inactive-active electrode method is much more painful than by this procedure, three patients having testified to this effect after one experience with each.

In this series of 200 cases, 80 per cent were treated by coagulating strips of endocervix along the canal anteriorly, posteriorly, and at either side using a full dose of diathermy in each position, while in 20 per cent the electrode was rotated while the current was flowing, sixteen seconds of exposure being given in canals one inch long (the equivalent of the four doses administered in the previous 80 per cent) and this time was varied to meet the needs in longer and shorter canals. Most of these complete coagulations were given in cervices in which

there was a large canal until it was realized that the scars were very soft, causing no narrowing of the lumen. In only two cases was the contraction enough to cause symptoms and in these the scar tissue was so thin and elastic that dilatation was accomplished with unexpected ease. One had had four treatments alleged to have completely eradicated the endocervix with cautery on two occasions, and diathermy by the indifferent electrode method once, while the other case had had

Fig. 6.—Coagulum adhering to electrodes of dummy tip.

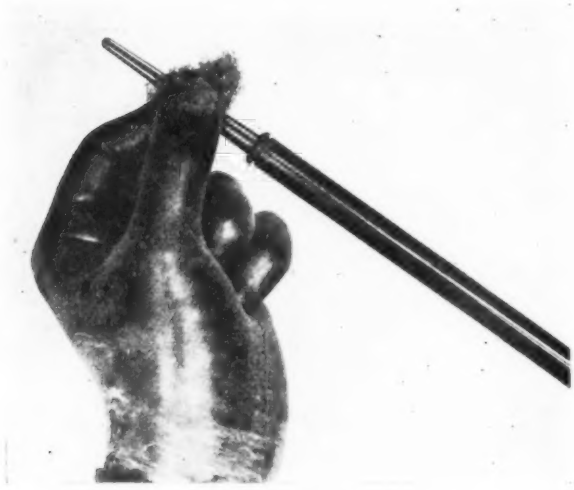

Fig. 7.—Method of short-circuiting the tip with steel wool for the purposes of getting the meter reading.

three treatments with destructive heat and considerable scar must have existed before "bipolar" treatment was administered. With the exception of these two cases the results were excellent though in eleven cases two applications were administered; in four cases, three applications, and in three cases, four applications were necessary to effect a cure. These cases occurred early in the use of this electrode when the operator, fearing overdose, gave quarter or half doses which naturally required repetition.

The erosion tip shown in Fig. 2 proved very satisfactory for the

treatment of erosions and other lesions on the portio as well as areas of ulceration in senile vaginitis. Both ball tips are placed in contact with the eroded surface and an exposure of one second is given, repeating the process until the surface is coagulated from the external os out to the margin of the lesion. When large areas are to be coagulated, the current is turned on and the area is coagulated by drawing the ball tips over the tissue surface. Here as in the canal, the mucus plays no detrimental part but provides good electrical contact.

When all pathologic tissue has been coagulated, a wick saturated with a solution of one of the proteolytic enzymes is packed into the canal. This hastens the disintegration of the coagulum and separation of slough. Usually a slim cone of slough can be detached and removed in one piece on the third day leaving a clean surface which heals rapidly.

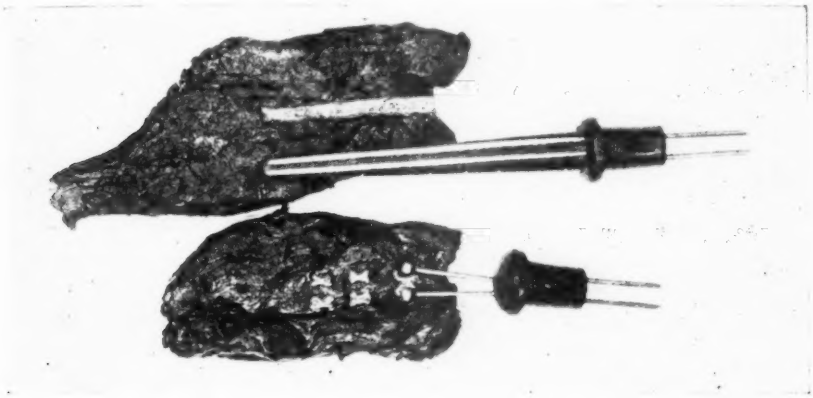

Fig. 8.—Meat coagulated with the intracervical and erosion tips.

Erosions are completely epithelized in ten to fourteen days unless they are very large, while this process takes longer in the canal. Enzymal is used only while slough is present and 5 per cent mercurochrome or 20 per cent argyrol is substituted for the remainder of the after-treatment. A daily warm borax or salt solution douche is prescribed to free the vagina of discharge, which is copious and watery for three or four days, after which it decreases daily until it disappears.

In the treatment of cysts which are close enough to the surface of the cervix to be seen, no agent is superior to coagulating diathermy and in the past the indifferent and active electrode arrangement was employed, the vaginal speculum serving as indifferent electrode. This has recently given place to a bipolar electrode which fits into the bipolar handle illustrated, and it is no longer necessary to use the indifferent electrode. The tip carries two parallel needles similar to the nose and throat instrument devised by Samengo[2] and illustrated in his paper, except that the needles are blocked with insulating material which

permits current to flow only from the terminal quarter inches of the needles. In employing this instrument, the needles are plunged into the cyst before the current is turned on, and an exposure of one second is sufficient to coagulate the thin cyst wall, sterilize its contents, and destroy the cellular elements in the wall by heat conducted by the fluid contents. It is rarely necessary to apply the tips directly to the interior of the cyst wall so that tissue may be coagulated by contact application, but there is no objection to this practice.

CONCLUSIONS

1. In treating chronic endocervicitis by means of destructive heat, it must be borne in mind that the work done on the tissue equals the product of the power applied to the tissue, times the duration of the application.

2. The problem of uniformity of dose and depth of tissue destruction depends upon the use of this formula (Work = Power × Time) and the amount of scar is determined by the operator's ability to give uniform doses of this destructive heat.

3. In using the cautery the power applied is an unknown quantity.

4. Diathermy with this electrode eliminates the long current pathway with its resistance, which introduces the element of uncertainty in diathermy by the ordinary active and inactive electrode method.

5. It is not necessary to remove the mucus from the canal. Its presence is desirable in that it provides good electrical contact between electrode and tissue.

6. The egg albumen process which measures the output of the machine in terms of coagulation also permits the operator to become immediately acquainted with the characteristics of a new machine.

7. The treatment is least painful of all the methods in which destructive heat is employed.

8. Healing is prompt when the pathology is entirely eradicated, scar tissue is negligible and is softer than scars after cautery.

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121 East Sixtieth Street.

THE ERYTHROCYTE SEDIMENTATION TEST IN GYNECOLOGY*

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THE erythrocyte sedimentation test has come into prominence since Fahraeus[2] in 1918 determined the sedimentation velocity of the blood of pregnant women. Sedimentation, however, was known to the early phlebotomists, by whom the hastened settling of inflammatory blood was considered a sign of clinical importance. Galen referred to it as the "Crustica Phlogistica," as mentioned by John Hunter[1] in 1797 in his comments on blood sedimentation. With the abandonment of phlebotomy the phenomenon of sedimentation seems to have attracted little attention until Fahraeus made his valuable contribution. Since then the test has evoked universal interest.

The sedimentation test may be defined as a nonspecific reaction caused clinically by inflammation or tissue destruction and manifested by increased velocity of sedimentation of the red cells in citrated blood.

Nearly all writers on erythrocyte sedimentation express the opinion that the test is of value in indicating the presence of infection and tissue destruction in some part of the body. As to the site and nature of the process it offers no definite information. It is claimed to be a more certain indicator of inflammation, however, than either the temperature curve or the leucocyte count.

The time required for complete sedimentation of the red cells in normal individuals, as determined by Löhr,[5] who studied sedimentation in 110 healthy subjects, is 1200 to 1400 minutes for men, 850 to 1000 minutes for women, and an average of 300 minutes for children. The time in which sedimentation occurs in pathologic conditions varies from one hour or more down to minutes, depending upon the acuteness of the condition and the extent of tissue involvement.

Sedimentation is increased in pregnancy, as was first observed by Fahraeus.[2] This observation was confirmed by Linzenmeier[3] who pointed out that change in sedimentation does not take place before the fourth month. Kovacz[11] states that pregnancy is the only normal condition in which sedimentation is increased. Balachowsky[20] claims, however, that acceleration and retardation may occur suddenly after meals.

If pregnancy and the taking of food are the only conditions which

*Read at a meeting of the Philadelphia Obstetrical Society, October 4, 1928.

produce positive tests in healthy individuals what are the pathologic conditions in which we may expect positive findings? The test has been applied to almost every abnormal process, as evidenced by the many articles in the literature, especially from Continental Europe, and to say that positive findings may be expected where there is an elevation of temperature would not be far wrong. The test goes further, however, in that it still denotes the presence of inflammation and tissue destruction after the temperature has reached normal. A few of the conditions wherein the test has been found positive, aside from inflammatory processes, are tuberculosis, malignancy, secondary syphilis and syphilitic involvement of the nervous system, malaria, pernicious anemia, leucemia, fractures and other traumatic conditions (including aseptic wounds) where there is resorption of tissue exudate, following surgical operations where a general anesthetic is used, and the acute infectious diseases. We would call attention, however, that successful vaccination[22] causes a marked reaction and should be borne in mind with hospital cases where vaccination is obligatory.

Are there any conditions wherein sedimentation is retarded? Linzenmeier[4] states that narcotics and heat hold it in check. Puxeddu[18] says that a delay of forty to ninety minutes was constantly observed in cases treated by diathermy. Kovacz[11] observes that it is usually retarded in liver diseases and cholelithiasis. Linstead,[31] who reports 12,000 tests, mentions icterus, cyanosis and anaphylaxis as retarding factors. Greisheimer[30] found that sedimentation was not materially affected by menstruation.

It has been found that sedimentation is especially sensitive to pelvic inflammatory conditions. Friedlander[14] in 1924 was the first in this country to report the use of the test in gynecologic diagnosis. Next, Baer and Reis[21] in 1925 report the results of their observations along the same lines. Since then many others have adopted the test as an aid in the diagnosis of pelvic disease. As surgical treatment in gynecologic patients is generally elective, anything that offers aid in formulating a correct line of treatment should be taken advantage of. Therefore, following the excellent reports of those who are using sedimentation as an aid in gynecologic practice ([6, 7, 8, 9, 10, 12, 13, 14, 16, 19, 21, 24, 26, 27, 28, 29, 32]), we are employing the test routinely in the Gynecologic Department of the Jefferson Medical College Hospital, and wish to report our methods and results. The test as usually done, however, requires considerable time; so after examining the various methods we have chosen that of Cutler,[25] with slight modifications, as being the most useful. It is graphic and records in detail the variations of sedimentation, which may be read at a glance. It requires periods of five minute readings for only one hour, and if desired a reading at the end of two hours.

The technic is as follows: With a five or ten c.c. sterile glass syringe, 0.5 c.c. of a 3 per cent solution of sterile sodium citrate is drawn into the syringe. The needle is then inserted into a vein of the patient and 4.5 c.c. of blood withdrawn. The blood and citrate solution are then mixed by backward and forward movements of the plunger of the syringe, but not by shaking as shaking might mix air with the solution. After thoroughly mixing, the citrated blood is then gently forced into a small glass (Cutler) tube. This tube is graduated in millimeters to 50. The 5 c.c. of citrated blood should fill the tube to the exact level of the zero graduation mark. A paraffin-covered cork is inserted, the tube inverted and then placed upright in the rack, care being taken that it is in a vertical position. Readings of the descent of the red blood column are then made every five minutes

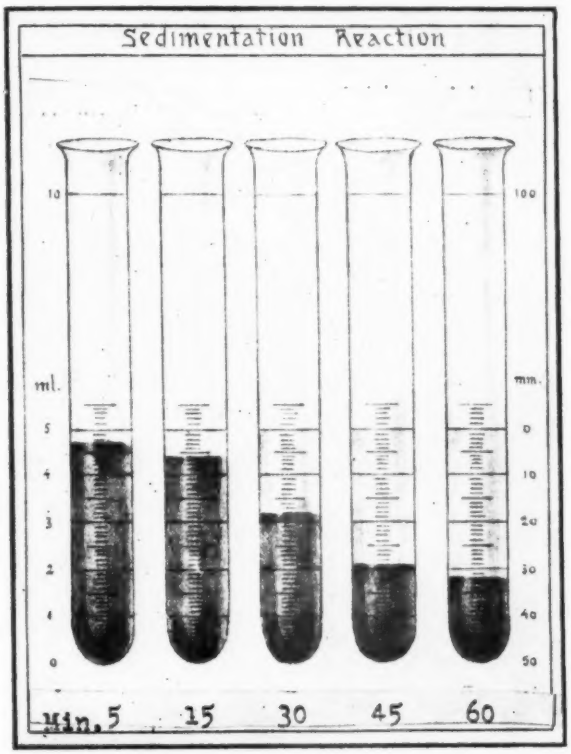

Fig. 1.—Appearance of sedimenting blood during one hour. (Cutler tubes.)

and the results recorded on the chart. The vertical scale of the chart indicates distance in millimeters of sedimentation while the horizontal scale represents five minute intervals of reading time. The charts are placed with the patient's records where, with other laboratory reports, they may be correlated with the clinical findings.

We believe the graphic method offers a distinct advantage over any other method of recording sedimentation. While it is of the greatest importance to know the distance to which the red cells sediment in a given time, this alone is not taking advantage of all the information the test furnishes. The manner in which they sediment

is of equal importance. Cutler[25] in his excellent work with this test in its relation to tuberculosis, pointed out that by recording graphically the results of the test the infective processes may be divided into four distinct groups, each represented on the chart by a line or curve, as he calls them. The more intense the inflammatory process, the sharper will be the curve. We have found the same observation holds true in gynecologic cases. Cutler designates two of these graphs as lines and two as curves, but to save confusion we have changed the nomenclature and call them all curves. First, the horizontal curve, which records normal sedimentation; second, the diagonal curve, which indicates a mild infective process; third, the double curve, which shows a distinct variation in the velocity of sedimentation within the hour, recording a more active infection or involvement; fourth, the vertical curve, which registers a precipitate drop in the red cells as found in the most severe forms of infection.

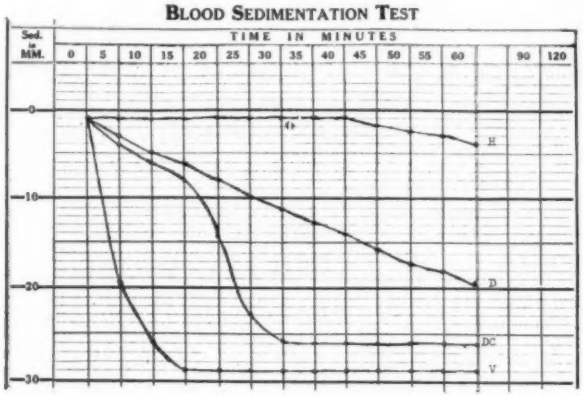

Fig. 2.—*H*, horizontal curve; *D*, diagonal curve; *DC*, double curve; *V*, vertical curve.

We include in this report a survey of the studies of 275 patients upon whom the test was employed and will discuss the points of interest of the various groups, as follows:

Abortions.—Because of the fact that in most abortions the element of sapremia predominates, we sometimes find it a difficult matter to determine which cases really show pelvic tissue infection. There were 32 cases in the group. Eighteen of these we have classified as sapremia because they ran mild clinical courses, all but one having normal white cell counts, and made undelayed recoveries after the saprophytic material was evacuated. Ten of these sapremic cases, (Table I) show marked variation in the sedimentation curve in contrast to the normal white cell counts. The remaining fourteen cases we have designated as infected, in that the pelvic structures were definitely involved. They had more marked symptoms, with leucocyte counts ranging from 12,000 to 30,000 and more prolonged con-

valescences. Table III, ten infected cases, shows the leucocyte count registering as marked reactions as the sedimentations. Two of these cases had unilateral adnexal disease, which may have existed before the abortions; another developed pelvic abscess, and another extensive cellulitis of the left broad ligament.

TABLE I. ABORTIONS, TEN CASES SHOWING SAPREMIA ONLY

CASE	SEDIMENTATION*	TEMPERATURE	WBC
1	35V	100.0	4,400
6	38V	102.0	8,200
11	30V	103.0	7,200
12	29DC	103.0	5,200
13	29DC	102.0	5,600
16	28DC	104.0	9,000
25	26DC	100.0	10,000
27	24D	99.0	6,600
30	26DC	99.3	9,000
31	35V	99.4	9,600

*The numbers refer to the distance in millimeters of sedimentation. The letters to the variety of curve.

TABLE II. ABORTIONS, THREE CLEAN CASES, SPONTANEOUS

CASE	SEDIMENTATION	TEMPERATURE	WBC
3	6H	99.6	8,400
17	8H	99.2	8,800
20	8H	99.2	8,200

TABLE III. INFECTED ABORTIONS, TEN CASES WITH DEFINITE PELVIC INFECTION

CASE	SEDIMENTATION	TEMPERATURE	WBC
2	35DC	104.0	14,800
4	25DC	100.4	12,400
8	38V	102.2	14,800
9	26D	99.6	14,400
14	33D	101.0	12,400
15	35V	100.4	12,000
18	32DC	101.0	12,500
22	25V	100.0	13,400
26	32V	102.0	18,200
32	32V	104.0	30,000

The fact that sedimentation is increased in pregnancy has little bearing on these cases as the abortions all occurred before the fourth month. The average drop for the entire group was 26 mm., which is rather high as compared with the other groups. This we attribute to inflammation (inflammatory toxemia) and tissue destruction with absorption (sapremia). Schumacher and Vogel[12] state that with normal temperature and leucocyte count any considerable change in sedimentation is a sign of inflammatory reaction or of softening and resorption of tumor tissue. Sapremia with its high sedimentation reaction partly bears this out, in that the sapremia cases show little if any leucocytosis although they have marked temperature reactions. The three clean spontaneous cases, shown in Table II, registered very

little reaction of any kind, indicating there was no systemic disturbance. While sedimentation offers no aid in differentiating the various forms of abortion, it does register a marked reaction in sapremia. This the leucocyte count often and the temperature curve sometimes fail to do.

Pelvic Inflammatory Disease.—As the sedimentation test expresses chiefly inflammatory reaction, we shall discuss these cases somewhat in detail. In the 65 cases we note as a general rule the greater the extent of the inflammatory process, the greater also will be the sedimentation reaction. In those cases where the test was repeated, the reaction, as the inflammatory process improved, becomes less marked. Thus, a vertical curve may be replaced by a double and then by a diagonal curve. With cessation of the infective process

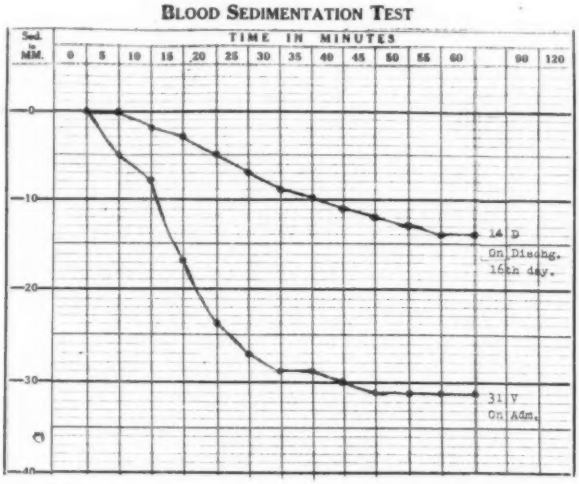

Fig. 3.—Case 59, acute inflammation. Temperature on admission 103° F., white blood count 14,800.

the regression eventually reaches normal, as indicated by the horizontal curve.

Correlating the white cell count, the temperature, and the sedimentation test, we find that in those cases having a rapid sedimentation the white cell count and temperature may be increased, although this does not always hold true, for in 49 per cent of the cases in the inflammatory group the white blood counts were normal when the sedimentation test denoted the presence of an active inflammatory process. Upon this very point rests the greatest value of the sedimentation test in gynecology. The white cell count and temperature may be normal and indicate the patient is ready for operation while the sedimentation, still too rapid, indicates the presence of active inflammation. Hence, in elective cases, if we heed the information

given by rapid sedimentation, we will wait. We prefer to have the reactions register as near the horizontal curve as possible but do not hesitate to operate in the presence of a diagonal curve registering a drop of 20 mm. or less. We do not operate, however, if sedimentation is represented by the double or the vertical curves. This delay we believe is on the side of safety. As to the matter of surgery in pelvic inflammatory cases, to those decidedly conservative, following the teachings of Curtis,[29] sedimentation will indicate the exact time when operation may be undertaken with the minimum risk. We feel that in the acute cases there is no question to decide; conservatism is the dictum. It is the subacute and chronic cases that present the real problems.

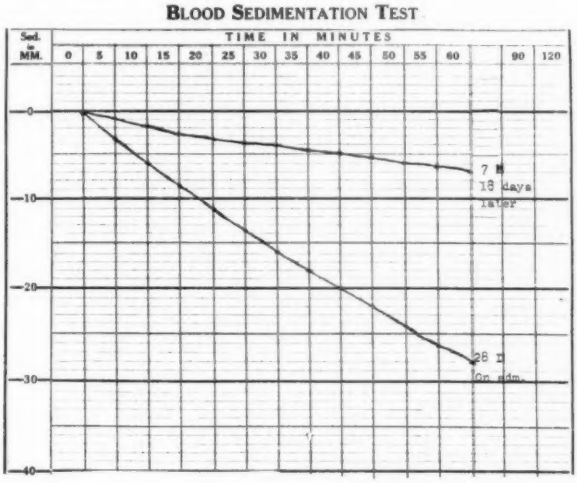

Fig. 4.—Case 71, subacute inflammation. Temperature 100° F., white blood count 13,800, 28D; 18 days later temperature was 98° F., white blood count was 8,500, 7H.

In Table IV, there are twelve acute inflammatory cases all of which show a high white blood count. The initial sedimentation tests corresponded with the temperature, leucocyte count, and clinical find-

TABLE IV. ACUTE INFLAMMATORY CASES

CASE	SEDIMENTATION	TEMPERATURE*	WHITE BLOOD COUNT
13	26DC	101.4	17,500
24	30DC	101.2	20,000
27	29V	101.0	17,400
30	23DC	103.0	23,000
40	25DC	102.0	22,500
41	35V	101.0	23,000
50	24DC	102.0	16,200
56	25DC	102.0	16,400
57	27DC	103.0	22,000
59	31V	103.0	14,800
61	26DC	102.3	16,000
63	26V	101.0	15,800

*Elevations of temperature usually postoperative.

ings. The reactions were all of the vertical or double curve type. In all of these cases, with the exception of Case 13, the symptoms subsided. Case 13, after conservative treatment failed, returned to the hospital seven months later. The second admission is here tabulated under subacute inflammatory, Case 71.

TABLE V. SUBACUTE INFLAMMATORY CASES

CASE	SEDIMENTATION	TEMPERATURE	WHITE BLOOD COUNT		OPERATION
1	6H	99.6	7,000	10,800	No
2	5H	99.0	11,800		No
4	8H	100.0	7,000		No
5	10D	99.0	8,800		No
7	10D	100.6	5,000		No
12	24D	101.4	10,200		No
15	22D	102.0	5,700		No
18	23D	101.4	11,700		No
20	25D	102.6	11,800		BS-LO
21	18D	102.0	16,500		HBSO
23	24DC	102.0	15,200		No
25	27DC	99.2	9,200		No
28	21DC	100.0	4,600		No
29	24DC	102.0	7,600		No
31	30D	103.8	15,200		No
37	30DC	101.8	10,800		H-Ap.
39	30V	102.0	9,200	10,200	HBSO
49	23DC	99.4	14,200		No
52	32DC	103.3	10,300		No
54	23D	99.4	11,400		No
55	29DC	99.3	12,800		No
58	20DC	100.0	13,800	7,000	No
60	18D	99.0	10,200	6,800	No
62	26DC	102.0	9,800		HBSO
65	28V	100.0	6,900		No
66	35V	102.0	6,000	3,400	HBSO
68	15D	98.0	7,400		No
69	26DC	101.0	11,500		No
70	21D	99.8	13,600		No
71	28D	100.0	13,800	8,500	HBSOA

Of the 30 subacute cases, Table V, seven were operated upon and twenty-three recovered without operation. As a rule the sedimentation reaction in this group was less marked than in the acute group, although in some of the cases it registered as great a fall. Case 39, with extensive inflammatory involvement, was in the hospital eight months. At no time did the leucocyte count exceed 10,200. She ran a septic temperature for the first three months, after which both temperature and white count were normal. The sedimentation test, however, remained persistently rapid. It was felt that added delay after six months conservative treatment would bring no further improvement. At operation extensive adhesions with many peritoneal cysts were encountered. Upon freeing adhesions, pus was found, and the tissues bore the appearance of a subacute inflammation. Convalescence was complicated by a severe infection of the abdominal wound, which kept the patient in the hospital two months longer. Contrasting this with Case 71 (originally Case 13 of the acute group),

in which sedimentation had regressed almost to normal, we found at operation all evidence of acute inflammation had disappeared. After removing the uterus, together with the tubes, ovaries and appendix, the patient had a normal convalescence. In one other of our operative cases of this group, Case 20, we encountered pus in the form of well walled-off bilateral pyosalpinges. This patient, however, had a normal convalescence. Her sedimentation, 25D, was too rapid for elective operation. Because of such experiences we have modified our views and chosen a reading of 20D or less as indicating the more favorable time for operation in that we feel that where the readings are greater than 20D pus may be found.

In the group of 23 chronic cases there were seven abdominal operations performed. In one of these, Case 51, Table VI, an old pus tube on the right side and a hydrosalpinx on the left were found. Both

TABLE VI. CHRONIC INFLAMMATORY CASES

CASE	SEDIMENTATION	TEMPERATURE	WHITE BLOOD COUNT	OPERATION
3	13D	102.4	10,800	BSLO
6	7H	101.0	8,000	Adhes.
8	20D	99.2	6,900	No
9	15D	99.2	7,200	BSO
10	18D	100.8	9,400	HLSO, Ad.
11	16D	100.4	8,600	Trach.
16	17D	99.6	4,500	No
17	16D	100.6	9,800	No
19	27D	100.2	8,000	HLSO
22	22D	104.2	8,400	Caut.
26	25DC	101.0	7,200	No
34	30V	99.0	7,200	No
35	30V	99.6	8,000	No
36	28V	100.4	9,200	No
38	22D	101.0	6,600	Fist.
43	9H	98.0	4,600	No
44	10D	98.1	10,400	No
45	22D	98.8	10,400	No
46	8H	98.0	10,600	HBSO
47	10D	97.6	8,300	No
48	17D	98.0	11,300	No
51	24D	98.2	10,200	BSLO
53	7H	99.1	8,000	No

tubes together with a left cystic ovary were removed, and the patient had a normal convalescence. It will be noted that the sedimentation registered 24D. In the three cases of the entire inflammatory group where pus was found at operation the sedimentations were 24DC, 25D, 24D respectively, all representing drops greater than 20 mm. Haselhorst[7] states that in two hundred operations with negative sedimentation tests he found evidence of acute inflammation in only three.

In the inflammatory group our studies show that the more acute the inflammation the greater will be the sedimentation (Fig. 5). The acute cases, ten in number, registered an average drop of 27 mm. There were five vertical and five double curves. The subacute aver-

aged 22 mm. There were three vertical, eleven double curves, eight diagonal greater than 20 mm., six diagonal less than 20 mm., and two horizontal. The chronic, an average of 18 mm., of which three were vertical, one double, five diagonal greater than 20 mm., and fourteen diagonal less than 20 mm. On certain cases where the test was repeated after operation we found a still more marked reaction than before operation. It seems quite probable that absorption of exudate following operation, especially in chronic inflammatory cases, causes increased sedimentation as well as elevation of temperature.

Myomata.—There were 41 cases in this group, of which 31 were treated by operation and 6 by radium. At operation seven were found to be complicated by chronic inflammation, as evidenced by

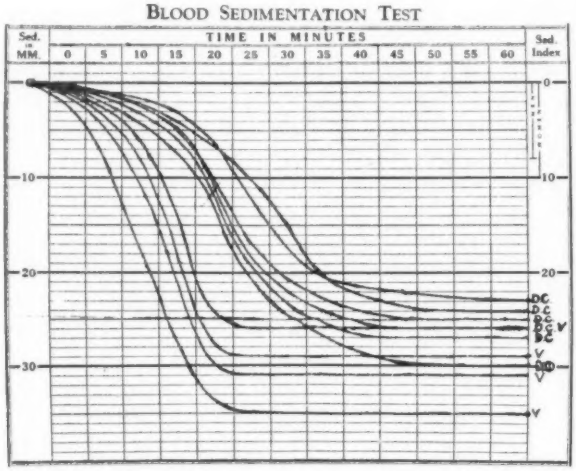

Fig. 5.—Twelve cases of acute pelvic inflammation (Table IV). (Two duplicates, 25DC and 26DC are not shown, see table.)

adhesions and congested tissue. There was one large degenerating myoma which gave an initial sedimentation reading of only 6H. This is the first instance we have encountered wherein the test did not correspond with the clinical findings. We fear there was an error of technic and are waiting to study the test in other similar cases. Of the seven cases complicated by chronic inflammation the average sedimentation reading was 29 mm., and all of them vertical or double curves, whereas that of the 32 noncomplicated cases was 16 mm.; 25 of these had a diagonal less than 20, 6 greater than 20 and only 1 a double curve. In one case of multiple myomata complicated by a three months pregnancy, the initial sedimentation reading was 30V, but as the case was one of the seven complicated also by inflammation we do not attribute the high reading to the pregnancy. One uncomplicated case of adenomyoma of the fundus had

a reading of 13D. Linzenmeier[6] says that the test may be used to differentiate pregnancy from myoma. We do not feel that it can be of much practical value, however, because of the incidence in myomata of complicating inflammatory processes which produce sedimentation curves similar to those formed in pregnancy. The test in connection with myoma will indicate, however, the cases in which we may expect to encounter inflammatory complications.

Birth injuries, relaxations and displacements.—There were 56 cases, 50 operations. This may be classified as a noninflammatory group. The sedimentation readings in this group approached more nearly normal than in any of the other preceding groups, the average being 14 mm. In only six cases was the white cell count over 10,000. One case with a cystocele and rectocele, had a leucocytosis of 13,500 and a sedimentation reading of 23DC. The orthopedic consultant found an osteoarthritis of the vertebrae. In a case of procidentia with

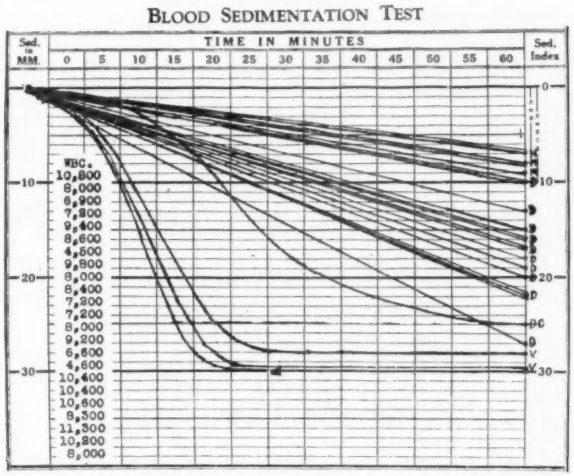

Fig. 6.—Twenty-three cases of chronic pelvic inflammation (Table VI).

normal temperature and leucocyte count the sedimentation reaction was 29D. A protruding ulcerated cervix was the only cause found for this marked reaction. Following rest and treatment of the ulceration, sedimentation dropped to 19D. Freedom from inflammation in this group was confirmed by the sedimentation reaction, and it offers a good illustration of the accuracy of the test.

Cancer.—In this group there were 30 cases, distributed as follows: 20 of the uterus; 7 of the uterine appendages and other intra-abdominal organs; 3 of the bladder. We found that the further advanced the malignant process, the more marked the sedimentation reaction. Thus, one case of early carcinoma of the cervix had a reading of 10D; one case of the bladder with beginning ulceration, 17D; another of early recurrence in the stumps of the round ligaments,

after a complete hysterectomy four and a half years previously, 19D. In contrast to these the reactions in the more advanced cases were greater. In regard to the influence of radium on sedimentation, in 7 cases where the test was repeated following the use of radium greater reactions were recorded. Kochnevaia[15] in 45 cases after the use of radium also notes increased sedimentation. Our observations in cancer bear out those of Roffo[17] who, analyzing the reaction in 101 cases, concluded that sedimentation is increased in all but the superficial malignant growths in the early, apparently localized phase.

Ectopic Pregnancies.—Among 10 patients who had ectopic pregnancies, one early and unruptured had a sedimentation of 8D; one with tubal abortion and slight loss of blood, 14D; one with early rupture and moderate hemorrhage, 9D; two with acute ruptures and marked hemorrhage registered 27DC and 32DC respectively; two with old ruptures registered 20D and 26D. Thus, in these few cases, we find that in early unruptured and in early ruptured ectopic pregnancies with slight hemorrhage there is only moderate disturbance of sedimentation; whereas, in those with marked hemorrhage and in those where rupture had existed for several days, the sedimentation reactions are marked. Linzenmeier[6] says that a slow sedimentation may help to differentiate between a recently disturbed ectopic and acute adnexal or peritoneal affections. We believe this to be a correct observation. A rapid sedimentation should be against an early uncomplicated ectopic that has undergone little disturbance.

Endocervicitis.—In six cases, five had very slow, practically normal, sedimentation, the sixth registered 22D. This patient had had a recent abortion, and the uterus was found to contain placental tissue. The question here arises, Is the cervix with its free drainage really the site of focal infections causing systemic disturbance? In the five cases above mentioned the sedimentation test registered no systemic change.

Ovarian Cysts.—In seven cases, one with a twisted pedicle registered 27DC; three with adhesions were correspondingly high; three uncomplicated cases had practically a normal sedimentation.

Urologic Cases.—There were 11 cases involving the kidney pelvis and urinary tract. With the exception of three cases of pyelitis of pregnancy that registered persistently rapid sedimentation, the cases of this group correspond to those of the inflammatory group in that the speed of sedimentation depended upon the extent of the inflammatory process. Thus, a case of pyonephrosis gave the same rapid rate, 35V, as did one of acute cystitis, whereas in four cases of ureteral stricture the average was 12D.

In addition the sedimentation test emphasizes the importance of careful physical examination. Thus, in a case where the pelvic findings did not account for the sedimentation reaction, a pleural effusion

and a plus 4 Wassermann were found; in another, a right upper lobe tuberculous lesion was found. An explanation should always be sought for a rapid sedimentation.

In conclusion we find:

1. The graphic method offers an excellent means of interpreting sedimentation.

2. There are no purely diagnostic features of the test.

3. Verifying the work of others, the sedimentation test is a sensitive means of recognizing the presence of inflammation and tissue destruction.

4. The only means heretofore of guiding us in determining the most favorable time for operative intervention were the symptoms, the temperature, the blood count and the reaction to examination. With the sedimentation test we feel we have an added safeguard.

5. In pelvic inflammatory cases we believe a reading of 20D or less, when previously higher, indicates that the inflammatory process has subsided sufficiently to permit of surgical intervention.

6. The sedimentation test is a more certain means of indicating inflammatory change than is the white blood count or temperature curve.

7. In early ectopic pregnancy unruptured and uncomplicated the sedimentation rate will be slow.

8. The test will not differentiate between appendicitis, pus tubes and ruptured ectopic pregnancy with marked hemorrhage.

9. Inflammatory change and tissue involvement elsewhere in the body (viz. lungs) influence the sedimentation reaction—a point in favor of careful physical examination.

10. In cancer cases sedimentation corresponds with the degree of tissue involvement.

11. In myoma the test will show in what cases we may expect inflammatory complications.

12. In only one instance in our group did the sedimentation test fail to correspond with the clinical findings at operation.

There was but one death in this group, a cancer case *in extremis* when admitted to the ward.

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(For discussion, see page 146.)

PELVIC FASCIA DYSTOCIA*

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THE commoner causes of dystocia are well known and readily diagnosed. In my practice, I have recently observed several cases in which the cause of the difficulty in labor was a structure not commonly recognized or even described as one capable of causing dystocia. I am therefore reporting the following cases as illustrative of what may be called pelvic fascia dystocia.

The pelvic fascia is the continuation of the endo-abdominal and iliac fascia. When passing beyond the brim of the pelvis it is known as the pelvic fascia. Just below the pelvic brim at the so-called white line it splits into three layers. One descends along the lateral pelvic wall lying on the obturator internus muscle, the obturator fascia. The other two layers split to enclose the levator muscle at part of its origin. The superficial layer covers the anterior portion of the levator and forms with the corresponding half of the other side one layer of the triangular ligament. The deep layer is known as the fascia endopelvina or rectovesical fascia. This is the important fascial structure. The portion of this fascia which lies between the symphysis pubis in front and the cervix behind is known as the uteropubic fascial plane. It is this uteropubic fascial plane which may cause difficulty in labor.

In short stocky women, with the so-called male type of pelvis, in which the bones are heavy and the symphysis long and high and in whom the inclination of the pelvis is faulty, we find the uteropubic fascia unusually tough and strong. In these women, who do not readily become pregnant in the first place, labor is prolonged, dilatation of the cervix is interfered with, and retraction of the cervix does not occur, as it is prevented by the inelasticity of this fascial plane. The presenting part is held up by the incompletely dilated cervix and rides upon this structure. Descent does not occur unless and until this

*Read at a meeting of the Beth David Hospital Clinical Society, Jan. 9, 1929.

fascia is lacerated either spontaneously by effective uterine contractions or artificially as a result of operative interference from below. At this point, may I mention that it is most important to differentiate between the above and that type of dystocia where the bony pelvis is not ample for descent.

The following cases are reported as illustrative of pelvic fascia dystocia:

CASE 1.—Mrs. L. S., admitted to Sydenham Hospital, September 2, 1927, was a primipara, twenty-six years of age who went into labor spontaneously one week after expected date of confinement. The membranes ruptured at the onset of labor. The physical examination revealed a short stocky young woman, 4 feet 10 inches tall, weighing 140 pounds. The pelvic measurements were as follows: interspinous 19 cm., intercristal 24 cm., intertrochanteric 30.5 cm., left oblique 20.5 cm., right oblique 20 cm., external conjugate 18.5 cm., transverse diameter of outlet 8.5 cm., symphysis pubis 6.5 cm., heavy and directed vertically upwards (with patient in lithotomy position). After twenty-four hours of first stage pains there was no descent of the presenting part which was dipping deeply in the brim. Cervical dilatation was four fingers' (rectal). From abdominal examination it was felt that the fetal head was small and should easily have come through.

Examination per vaginam under gas and oxygen anesthesia disclosed a vertex presentation, the occiput pointing directly anterior to the symphysis pubis, a small fetal head, and a relatively ample inlet. The cervix was 4½ fingers dilated and not retracted. After allowing the patient to come out of the anesthesia, a small dose of pituitrin was given to increase slightly the uterine contractions. One hour later, although the patient was having good uterine contractions, there was no progress of the presenting part. Labor was, therefore, terminated by a median forceps operation. Before this was done, the pelvic floor was thoroughly ironed out. When traction was begun, the uteropubic fascial plane was felt as a dense, tough, thick, leathery sheet, stretching across the roof of the birth canal. Long and slow traction was required to bring down the vertex and to spare this fascia as much as possible from extensive laceration. A small living female child, weighing 5 pounds 9 ounces was delivered. The perineum offered no difficulty whatsoever, first, because it was manually stretched at the onset of the operation and secondly, because of the small fetal head. The postpartum course was entirely uneventful. An examination six weeks later revealed a cystocele, a retroverted uterus, and a pelvic floor which was only slightly relaxed. This patient has a hernia of the bladder caused by the laceration of the uteropubic fascial plane.

CASE 2.—Mrs. L. T., a primipara, aged twenty-four, was admitted to Mount Morris Park Hospital, March 11, 1927. Labor began two weeks after expected date. The patient was 5 feet tall and weighed 172 pounds at term, gaining 45 pounds during her pregnancy. Physical examination revealed a funnel pelvis. Measurements were as follows: interspinous 23 cm., intercristal 27 cm., left oblique 23 cm., right oblique 21.5 cm., external conjugate 21.5 cm., true conjugate ample, transverse diameter of outlet 7.5 cm., symphysis pubis 6.5 cm., heavy and with vertical inclination (with patient in lithotomy position). First stage of labor very much prolonged. Cervix dilated up to 5 fingers but was not retracted. Presenting part (vertex- L. O. T.) at the brim; not too large to come through. Uterine contractions irregular and ineffectual.

Under anesthesia, patient was delivered by a mid-forceps operation (Kielland). At the time of the forceps delivery the roof of the birth canal could be felt as a rigid, dense, tough fascial sheet which offered considerable resistance. The vertex was brought down with great difficulty and only after extensive laceration

of the uteropubic fascia. A living baby weighing 7 pounds 12 ounces was delivered.

Examination of this patient two months postpartum revealed a retroverted uterus and a large cystocele (caused by laceration of the pelvic fascia.)

CASE 3.—Mrs. A. M., a primipara, twenty-three years of age, was admitted to Mt. Morris Park Hospital, July 1, 1925, in labor at term. She was a short heavy set woman, 5 feet tall, weighing 155 pounds. The pelvic examination revealed a male type funnel pelvis, with the following measurements: interspinous 22 cm., intercristal 24 cm., left oblique 20.5 cm., right oblique 21 cm., external conjugate 20 cm., transverse diameter of outlet 7 cm., symphysis pubis 6 cm., promontory not reached, true conjugate ample.

At the last prenatal examination made one week before the onset of labor the following was noted: Vertex presentation, L. O. A., small head dipping into brim, beginning effacement of cervix.

After twenty-eight hours of labor with the cervix fully dilated but not retracted, there was no descent of the presenting part. When the membranes were artificially ruptured at this time, deeply meconium stained liquor amnii escaped. Labor therefore, was, terminated by a median (Kielland) forceps operation. The first stage of the extraction was very difficult because of an unusually strong obstructing uteropubic fascia. A right lateral episiotomy spared the pelvic floor; a living male child weighing 7 pounds 10 ounces was delivered. The postpartum convalescence was uneventful.

Three months later a pelvic examination revealed a firm episiotomy scar with fair pelvic floor, a slightly retroverted uterus, and a moderate sized cystocele.

CASE 4.—Mrs. F. K., a primipara, twenty-eight years old, was admitted to Sydenham Hospital in labor, on May 10, 1927. The patient was 5 ft. 4 in. tall, and weighed 156 pounds at term (with a gain of 31 pounds during pregnancy). Pelvic measurements: interspinous 23 cm., intercristal 28 cm., left oblique 21 cm., right oblique 20 cm., external conjugate 20 cm., transverse of outlet 8 cm., symphysis pubis 6.5 cm. Promontory could not be reached on pelvic examination. Vertex presentation, L. O. A. position, head deep in brim.

The first stage of labor was very much prolonged; cervix was not retracted but dilated up to 4 fingers. Second stage pains were ineffectual. A median forceps (Kielland) operation was performed and a living male child weighing 7 pounds 14 ounces, was delivered. The extraction was exceedingly difficult because of the obstructing uteropubic fascia, which was rather extensively lacerated in this case.

Pelvic examination two months postpartum revealed a lacerated and relaxed pelvic floor, a slightly retroverted uterus, and a very large cystocele. The cervix presented two small lateral scars.

This patient has been fitted with a supporting pessary for the relief of symptoms caused by the cystocele.

DISCUSSION

That the fascia caused the dystocia in each of the above cases was evident at the time of delivery and again clearly demonstrated by the easy, rapid, and often precipitate labors which these women had in subsequent deliveries. However, it must not be construed that these patients are peculiar individuals with developmental abnormalities of their pelvic fascia. They rather fit in a class of difficult labors to which the name *dystrophia dystocia syndrome* has been given by

DeLee.[1] Some of the main features of this class as mentioned by him are:

1. Justominor or masculine type pelvis with other signs of hypopituitarism, such as small cervix, narrow rigid vagina.
2. Old primipara.
3. Postmaturity of the child (prolonged pregnancy).
4. Nonengagement of the fetal head when labor begins.
5. Premature rupture of the membranes.
6. Weak pains with prolonged first stage.
7. Familial dystocia.

Since all of these patients have difficult labors, often with extensive injury of the soft parts, it is questionable whether delivery *per vias naturales* should be the method of choice. Some authorities[1] feel that cesarean section is perhaps the better procedure. When the diagnosis is made early in labor and no manipulation from below has been attempted, section is far less damaging to the patient. By this method the woman is returned to good health, well able to take up her maternal duties and without the invalidism which follows extensive injury to the supporting pelvic structures.

CONCLUSIONS

1. The uteropubic fascia is an infrequent and not commonly recognized cause of dystocia.
2. It is important to differentiate the pelvic fascia from other causes preventing descent of the presenting part.
3. Certain injuries of the birth canal are unavoidable.

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A STATISTICAL STUDY OF PUERPERAL MORBIDITY IN HOSPITAL PRACTICE*

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MORBIDITY studies constitute an important part of the regular survey of hospital work which is now a feature of the better institutions of North America. In hospital obstetric practice it is especially important that such a gauge of results be maintained, and it is unfortunate that the standards by which the word "morbidity" is defined vary so greatly.[1] This present study was suggested by a questionnaire on the subject by P. Brooke Bland of Jefferson Medical College, Philadelphia.

In our institution, we long ago adopted the standard of the Rotunda Hospital of Dublin which is probably identical with that of the British Medical Association. This defines obstetric morbidity as follows: a case shall be considered as morbid which presents an elevation of temperature to 100° F. or over on two separate days of the puerperium, there being an interval of at least twenty-four hours between the two readings under consideration, and the first twenty-four hours postpartum not being included. This is considerably more rigid than the average standards current in this country, the usual basis being on temperature readings of at least 100.5° F. Our statistical studies, therefore, may be expected to show a high rate.

My conclusions on the puerperal morbidity in our hospital practice have been drawn from a study of 446 consecutive obstetric cases without effort to segregate patients or to "correct" figures. In this group are included therefore all patients admitted to our obstetric department, both those who had the benefit of skilled obstetric attention in their prenatal days and at their delivery, as well as those who were sent in by ambulance after complications had developed outside, oftentimes under the care of entirely untrained midwives. These patients who have been studied were not all delivered by our staff obstetricians, a certain proportion of them having been attended by practitioners having this privilege in this hospital.

Normal deliveries and operative obstetrics are studied together before being analyzed so that my figures represent the actual morbidity rates in this hospital under all possible circumstances, thus representing a fairly comprehensive average.

*Presented as a Thesis to the School of Medicine, St. John's University, Shanghai, China.

SIGNIFICANCE OF MORBIDITY

It is conceded that a portion of the total morbidity probably results from some degree or some type of infection, although it is inconceivable that this can be true in more than a small part of all the women in this morbid class. Other factors undoubtedly play a rôle in the production of a febrile puerperium, and I have studied these figures critically in an attempt to develop them. Having differentiated between infection of even low degree and other factors, it is next desired to draw conclusions which may serve still further to reduce the elements of risk in a delivery even under the excellent present-day conditions.

ANALYSIS OF MORBID CASES

Number of cases studied, 446; number of morbid cases, 88; per cent morbidity, 19.9.

Probable Causes:	Cases	Per cent
(a) Local Infection		
Acute vesicular dermatitis	1	0.22
Hypodermic abscess	2	0.44
Leg ulcer (luetic)	1	0.22
(b) Morbidity directly related to parturition		
Endocervicitis	2	0.44
Pelvic peritonitis	3	0.67
Perimetritis	2	0.44
Subinvolution of uterus	2	0.44
Abscess of broad ligament	1	0.22
Phlebitis	5	1.10
After cesarean	10	2.20
(c) Other Causes		
Pyelitis	11	2.48
Tonsillitis	1	0.22
Pharyngitis	1	0.22
Appendicitis	1	0.22
Lactation	19	4.25
Infected perineorrhaphy	7	1.56
Condyloma acuminata	1	0.22
Undetermined	18	3.96

SURGICAL PREPARATION FOR DELIVERY

Technic at St. Margaret Memorial Hospital.—At the onset of labor the vulva is washed with soap and water and shaved. Immediately before delivery the blood and mucus on the perineum are wiped away with cotton balls wet with diluted green soap. Care is taken not to use the cotton balls too wet in order to avoid having the soapy water run into the vaginal orifice. Another cotton ball is used to dry the perineum. The perineum is then painted with a mercurochrome-acetone alcohol solution taking special care to include all folds of the labia and introitus, and to allow a generous amount to run into the vaginal orifice.

Johnson and Siddall in 1922[2] studied the morbidity results in patients who had been carefully prepared for delivery by methods then in vogue, and then analyzed a group in which the preparation consisted of nothing more than clipping the pubic hair. The comparative results made them conclude that this latter procedure was sufficient and that no better results were to be obtained by what had been thought to be better care. Their total morbidity was not stated. Despite this opinion we should not be satisfied with such incomplete preparation.

H. W. Mayes[3] studied the comparative effects of various recognized methods, namely, preparation with soap and water, with 3½ per cent iodine in alcohol, 2 per cent and 4 per cent mercurochrome. He found that 3½ per cent iodine had no advantage over soap and water, but that the use of 2 per cent mercurochrome reduced their previous morbidity from 16.1 per cent to 8.1 per cent whereas 4 per cent mercurochrome lowered still further to 7.4 per cent. It is understood however that some of the virtue in their use of mercurochrome is to be found in its actual injection into the vagina.

DeLee[4] corroborates Mayes' opinion that after packing the uterus with gauze wet with mercurochrome it is still sterile after forty-eight hours in 8 out of 10 cases. We subscribe to these latter opinions, but prefer the mercurochrome-acetone-alcohol preparation mentioned above.

MORBIDITY FROM RECTAL AND VAGINAL EXAMINATIONS

	Morbid	Nonmorbid	Per Cent
Rectal and vaginal examinations	46	218	21.1
Rectal alone	24	198	12.1
Vaginal alone	0	2	0
No examination	1	6	0.2

From the above figures it is apparent that those patients who required both vaginal and rectal examinations during the course of their labor, underwent thereby an increased risk over those whose labor was conducted with rectal examinations alone. No comparison can be drawn with those having only vaginal examinations because there were only two such cases in this series. That this increased morbidity is due alone to the addition of the vaginal examination is questionable because of the fact that the occasion for most of those vaginal examinations was the existence or occurrence of some abnormality, often requiring operative interference.

PERINEAL LACERATION AND REPAIR

The careful preparation of the perineum described above is done with the fact in mind that perineorrhaphy will frequently be necessary, especially in primiparous women. Incision of the perineum is invariably done if laceration seems unavoidable because the repair and healing of a clean-cut wound is obviously better than that of a ragged-edged contused tear.

There were 436 pelvic deliveries and perineorrhaphy was done in 206 of these. A median episiotomy is preferred because this conforms to anatomic relations of the perineal body and the resulting wound is more symmetric, thus affording greater facility for careful apposition of separated muscles. In the light of its usefulness Titus does episiotomy not only to avoid inevitable laceration but even deliberately incises and repairs old rectoceles at the time of delivery.

Of the 206 perineorrhaphies 10 failed to heal by primary union, only four requiring subsequent repair; in the remaining 6, closure with function occurred by secondary union since only the skin surface over the muscles was involved. Of the 10 which separated only three were

morbid, thus indicating that in this series the infected perineum was a morbid factor in only 0.67 per cent of the total number.

ASSOCIATION BETWEEN MORBIDITY AND OPERATIVE PROCEDURES

Operation:	Morbid	Nonmorbid	Total
Forceps	32	104	136
Intrauterine pack (postpartum hemorrhage)	0	6	6
Version	1	5	6
Manual extraction (breech)	1	4	5
Bougie to induce labor	0	2	2
Cesarean section	10	8	18
Ruptured uterus (hysterectomy)	1	0	1
Total operative cases	45	129	174
Total nonoperative cases	43	229	272

Percentage deductions have not been attempted because of the smallness of these groups. However the morbidity percentages of the operative and nonoperative cases may be compared, 25.7 per cent for the former and 18.7 per cent for the latter. It is apparent from this that the need for operative obstetric interference during labor definitely increases a patient's risk, but not so greatly that it need be feared if necessary.

CESAREAN SECTION

In this hospital the lower uterine segment cesarean section is performed by means of a modified Krönig-Gellhorn type of operation, which is similar to the flap operation of Beck. Two and twenty-six hundredths per cent of the total obstetric morbidity were found to be in the cases requiring cesarean section. It is now the concensus of opinion that the danger in such cases increases not only after rupture of the membranes but also with the increase in the duration of labor before interference is undertaken, even though no internal examinations are made. This is in conformity with the report of Kerr-Holland.[5]

PYELITIS

Morbidity due to pyelitis is 2.46 per cent. It is interesting to note that 50 per cent of the women having fever from pyelitis are primiparae.

NUMBER OF PREGNANCIES AND MORBIDITY

Gravida	Number of morbid cases	Per cent morbidity
I	30	33
II	15	16
III	7	7.7
IV	2	2.2
V	3	3.3

It is apparent that primiparae make up the largest morbid group. There is a distinct decrease in the incidence of morbidity with subsequent pregnancies. Immunity possibly has something to do with this but the comparative ease of labor during the latter pregnancies,

thereby diminishing maternal exhaustion as well as providing many deliveries without interference, perhaps further explains the results.

PHLEBITIS

In the 446 deliveries I did not once encounter the classical "milk leg" with opalescent tint, extreme tenderness and pitting on pressure. Nevertheless five patients, or 1.13 per cent of the total morbidity, had phlebitis. This was invariably mild and characterized by only slight tenderness of the saphenous veins, slight swelling of the legs, and slight elevation of temperature.

Phlebitis is one of the outstanding febrile complications of pregnancy. Whether growing saprophytes from the genitals cause this complication or it is due to the influence of long rest in a recumbent posture, anemia, marasmus, etc., it is surprising that only 1.13 per cent of the morbid cases studied had phlebitis.

INFLUENCE OF LACTATION

The question is constantly debated whether or not lactation has anything to do with obstetric morbidity. It was formerly supposed that the establishment of milk is accompanied by fever. On the third or fourth day after delivery, the breasts become distended and there is the "prickling" sensation with moderate pain and sometimes enlargement of axillary glands, a phenomenon not unlike some inflammatory processes.

I found 4.25 per cent of our morbid cases with this engorgement, pain and tenderness of the breasts apparently its only cause. This was in fact one of our largest morbid groups. On the side of the nonmorbid cases, however, I found that 4.28 per cent of them had the same breast manifestations without elevation of temperature. It seems apparent therefore that the conclusions regarding the association between maternal morbidity and lactation are somewhat confused.

We are unable to find any other reason in a large number of cases for this febrile reaction. Moreover this fever is usually of transitory character so that we incline, against our will, to the belief that the onset of lactation is frequently the cause of fever in the puerperium.

CONSTIPATION

It is difficult to judge regarding constipation as a morbid factor in our hospital because there is a standing order for daily enemas if bowels do not move. Occasionally however for some reason or another, such as deep perineal laceration, some patients have been allowed to go for several days without movements. There are so few morbid cases among patients who have not had movements for three or more days without any other apparent cause that I have not attempted to record them.

CONCLUSIONS

1. Using the rigid standard defined by the British Medical Association, morbidity in our hospital from a study of 446 consecutive cases was 19.9 per cent. This included those cases which were delivered by nonstaff physicians having privileges in this hospital as well as those previously handled outside by midwives or physicians. It included both operative and spontaneous deliveries of all types on this service.

2. Using mercurochrome-acetone-alcohol solution for the preparation of the perineum the morbidity due to infected perineorrhaphy was only 1.56 per cent.

3. Vaginal examination increases risk of infection.

4. Operative procedures are accompanied by increased morbidity, cesarean section showing the highest incidence of all obstetric procedures.

5. Obstetric morbidity due to pyelitis is high, being 2.46 per cent of this series.

6. Morbidity due to phlebitis occurs in only 1.13 per cent of the total febrile cases.

7. There is a decrease of morbidity with each subsequent pregnancy.

8. Lactation seems to be a factor in the causation of puerperal morbidity.

For purposes of comparison statistical studies are valueless unless the conditions under which such studies are made conform strictly to similar standards. For example in this country one clinic reports with pride a puerperal morbidity apparently low whereas another may report a high rate. Investigation of the standards under which these figures were collected shows such wide variation that conditions and results may prove actually to be better in the latter clinic than in the former.

We subscribe heartily to the suggestion which has recently been advanced by Dr. P. Brooke Bland of Philadelphia to the effect that a standard should be adopted in this country for puerperal morbidity studies. For the purpose of international comparisons it might be well to adopt the rigid standards of the British.

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MALIGNANT GROWTHS OF THE UTERUS IN YOUNG GIRLS*

By Barton C. Hirst, M.D., Philadelphia, Pa.

AN INTERESTING operation in the Howard Hospital on a girl sixteen years old, for the removal of an intrauterine growth, directed our attention to the occurrence of malignant uterine tumors in the very young. The youngest subject under my personal observation previously had been an actress, twenty-four years of age, pregnant at term with an advanced but operable cervical cancer. I did a coincident cesarean section and panhysterectomy. The patient made a good recovery but six months later reappeared with an inoperable recurrence. This young woman had a four-plus Wassermann, a coincidence I have observed in several cases of cancer in the young. Another woman, a negress, twenty-seven years of age, applied to the Howard Hospital Dispensary some years ago with an inoperable carcinoma of the cervix, and I can recall at least two more at twenty-five or twenty-six, but in a long experience the patient who prompted this communication was much the youngest I had seen. In a somewhat cursory review of the literature, however, in which I was kindly assisted by Andrussier, who also assisted me in the operation, it appeared that these malignant growths of the uterus in the very young are not so excessively rare. P. Brooke Bland reported, I believe, two cases, one in a white woman, one in a negress, each twenty-three years old. Reifen and Engelhorn report cases at twenty and twenty-two years of age; Cragin and de Rouville one each at eighteen years of age; Stacey one at sixteen years; Frank one at twenty-six. Glockner reports a case of cervical cancer in a girl of seven and Adams one in a child only two and one-half years old.

In an analysis of 500 cases of uterine cancer in the *British Gynecological Journal* (1895-96), 2 per cent were found in women between twenty and twenty-five and Gusserow, in a study of 3471 cases, found one at seventeen, one at nineteen and 114 between twenty and thirty years of age.

Green-Armytge, writing from India in 1913, states that he has seen many cases of inoperable carcinoma in very young women and, in 9 patients of his own, one was twenty and 6 between twenty and thirty years of age.

The young girl who is the subject of this report was first seen by me when she was fifteen years old. She had had a cervical polyp removed by another gynecologist five months before, on account of profuse menorrhagia. For three months afterward there was no period and no bleeding. Two months later irregular bleeding

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began again and became very profuse. I found what looked like the stump of a polyp, which was exsected and the base fulgurated. The patient was not seen again for eleven months when her mother brought her to my office with the statement that she had been bleeding continuously ever since my operation and lately very profusely. On examination a soft, friable mass could be seen projecting from the external os but with the greater bulk mainly in the uterine cavity. This growth was removed in the hospital after dilatation of the cervical canal. The coincident curettage removed a surprising amount of hyperplastic endometrium. Subjected to a microscopic examination, the polypoid fungating material was reported by McKee and Case to show heaping up of epithelial cells, mitotic figures, rapid growth of the stroma and in view of the third occurrence, in their judgment, must be considered malignant, although as yet there was no penetration of the myometrium. On examining the slides, the growth seemed to me to conform to Ewing's description of a malignant adenoma of the uterus, but my opinion on microscopic pathology is naturally expressed with diffidence.

Case was kind enough to send me the pathologic report on the specimen removed at the first operation. "I have restudied the slides * * * and find that, in view of the subsequent history, the growth is not as benign as I reported. There is evidence of rapidity of growth both in the epithelial cells and the underlying endometrial tissue. The glands do not form the usual irregular structures found in adenocarcinoma, however, and I looked upon it, two years ago, as an active endometrial polyp. Evidently I was wrong for the subsequent history is that of a malignant rather than a benign growth."

A panhysterectomy, with removal of the appendages, was performed after receiving the pathologist's report. The patient made a good recovery. The uterine appendages were normal. I was anxious to know if there might be some abnormality of the pituitary to account for the extreme hyperplasia of the endometrium, as the patient was stout, and had the appearance of an abnormal endocrine subject, but an x-ray of the sella turcica showed nothing abnormal. It is now ten months since the operation and I am told by her mother that the girl's condition is good but the little patient is so sensitive about her operation that she refuses to see me.

This paper might be extended to include a discussion of the appropriate treatment of these cases but it would be irrelevant as the same treatment would be required at any age, and I take it we are agreed that for cancer of the cervix radium is to be preferred in most cases, while in cancer of the corpus, panhysterectomy gives the best end-results.

1821 Spruce Street.

(For discussion, see page 150.)

CEREBRAL BIRTH HEMORRHAGE IN PREMATURE AND IMMATURE INFANTS*

By Aaron Capper, B.S., M.D., Philadelphia, Pa.
(From the Department of Pediatrics, Jefferson Medical College)

IN THIS presentation I wish to emphasize the facts that forced themselves on my mind as a result of an investigation into the fate of the immature and premature child. I am not going to discuss the question of cerebral hemorrhage as it affects the child of normal birth weight. I shall limit myself to the problem of cerebral birth hemorrhage in the immature and premature infant. I desire to introduce the term immature into the literature of postnatal conditions as having a specific meaning, namely, an infant whose weight at birth is less than five pounds or 2500 grams, irrespective of whether it is born before term, at term, or after term. The word premature simply tells us that the baby was born before the 270 to 280 days of intrauterine life had expired. A premature infant may, however, be one having a normal weight and development and therefore not immature. On the other hand, an infant may be an overdue birth and yet be termed immature by virtue of its underweight, namely, less than five pounds, and because of its underdevelopment.

All the infants studied in this series, and they were close to 450, represented immature births and almost three-fourths of them were also premature.

I have dealt somewhat at length with the terms "immature" and "premature" advisedly, because of their important relationship to birth hemorrhages in general and especially to cerebral birth hemorrhages. I term the immature and premature infants vasolabile individuals, i.e., infants in whom a small trauma will produce hemorrhage. Their blood vessels are readily torn and injured. The elastic tissues are the last ones to develop in the body, and a study of the vascular systems of immature and premature infants discloses a poverty of elastic tissue, which necessarily predisposes the vessels to trauma and the hemorrhages commonly found. Many of the infants that I studied whose birth weights were very low showed many petechial hemorrhages in the skin, just as in cases of purpura or thrombopenia, and multiple hemorrhages in the viscera. In fact Yllpö went so far as to devise the so-called pinch-test as a prognostic criterion in infants of very low birth weight. He said that if pinching of the skin produced an immediate, lasting and spreading area of hemorrhage, the prognosis as regards the survival of the infant was very questionable. Hemor-

*Read at a meeting of the Obstetrical Society of Philadelphia, October 4, 1928.

rhages, cutaneous, visceral and cerebral, are very common, therefore, in immature and premature infants, but we shall focus our attention upon cerebral birth hemorrhage.

Up to within recent years, whenever cerebral hemorrhage was discovered, whether pre- or postmortem, the obstetrician was usually considered responsible, especially if found in an infant delivered by forceps. This conception no longer holds good. We know that the use of early and correctly applied forceps, especially low forceps, does not increase the danger of intracranial hemorrhage. On the other hand when prolonged and drawn-out labor causes marked intracranial venous stasis and particularly when forceps, median or high, are used as a last resort, then the danger of intracranial hemorrhage is very greatly increased.

What I have just said applies particularly to infants of normal birth weight. In the case of immature and premature infants, even if the obstetrician utilized the most ideal prophylaxis or watchful waiting policy, cerebral hemorrhage will nevertheless occur in many cases. This is so because that particular infant is vasolabile and the uterine contractions alone are sometimes sufficiently traumatizing to cause hemorrhage. I saw one infant born by cesarean section which showed many fine petechial hemorrhages in the skin. In that case the mother had only been given a short test of labor, and it seems that the few early uterine contractions were sufficiently great traumatic factors to cause hemorrhages.

The Schultze method of resuscitation has been responsible for the immediate death of an immature infant. I saw one immature, partially asphyxiated infant which stopped breathing altogether after the physician swung it twice à la Schultze. The postmortem examination disclosed what we thought was an extension and diffusion of an already existing small localized hemorrhage. In immature infants, where the blood vessels are very delicate, each swinging may cause cerebral hemorrhage which did not exist before the resuscitation began. I believe, therefore, that the Schultze method of resuscitation ought to be discarded.

Weiss examined 567 infants whose birth weights were less than five pounds. One fifth of those that came to postmortem had intracerebral and intrameningeal hemorrhages.

We are, therefore, forced to the conclusion that cerebral hemorrhages in immature infants are very common and the smaller the birth weight the more frequent the hemorrhage. Yllpö found hemorrhages in 90 per cent of the infants with a birth weight under 1000 grams, in 76 per cent of those weighing between 1001 and 1500 grams, in 35.3 per cent with a birth weight between 1501 and 2000, and only in 26.7 per cent of those whose birth weights ranged between 2001 and 2500 grams.

The macroscopic hemorrhages that occur in immature infants are usually subarachnoidal or pial, and occur on the convex surface of the brain along the longitudinal sinus or its smaller tributaries or under the cerebellum. One often finds large clots of blood in the third or lateral ventricles. In the brain substance itself the hemorrhages are usually microscopic and scattered. Subdural hemorrhages are rare in immature infants because the skull plates of the immature infants are soft and the edges are too pliable to act traumatizing. Moreover, in the immature infant the dura is more closely adherent to the skull than in the normal infant and hence can neither be folded nor stretched very much. Tentorial tears also occur more rarely in immature infants than in babies with a normal birth weight.

In the diagnosis of cerebral birth trauma in immature infants one must bear in mind that the cortex in those infants is relatively insensitive to stimuli, and cortical hemorrhages may therefore be present without giving rise to symptoms of cortical irritation. One is usually able to make a diagnosis of cerebral hemorrhage in the presence of convulsions, twitching, unilateral rigidity, palsy, irregular breathing or asphyxia. We should, however, get into the habit of suspecting cerebral birth trauma if an infant is too somnolent or insomnolent, cries too much, refuses to suckle, has repeated attacks of cyanosis, inspiratory stridor, nystagmus, ptosis, etc. I may be accused of suspecting cerebral hemorrhage in too many infants, but one cannot be too careful in excluding this condition. I recollect one case in which the only abnormal finding was a persistent rise in temperature without apparent cause. The ordinary methods for reduction of fever in an infant were of no avail. I suspected that the hyperthermia might be due to increased intracranial tension as a result of hemorrhage. My suspicion was intensified when I discovered an abnormally small anterior fontanelle, which meant that molding was difficult. A lumbar puncture revealed bloody spinal fluid. The subsequent occurrence of convulsions, irregular breathing, etc., confirmed the diagnosis.

The treatment of cerebral hemorrhage of immature infants does not differ much from that of full weight infants. The most important therapeutic measures are intramuscular and intraperitoneal injections of whole blood or blood serum, and lumbar puncture, repeated every twelve to twenty-four hours, depending upon the severity of the hemorrhage. The punctures are continued until the fluid comes clear. If there is no improvement, cisterna magna and ventricular punctures may be done. Occasionally one gets a dry spinal tap even in the face of definite cerebral hemorrhage. This may be due to the fact that the needle pushes the dura ahead of itself instead of piercing it, because the dura in the lumbar region is only loosely attached to the bone in the immature infant. In such a case, using a needle with a very fine

bore and doing the tap with the infant in the sitting posture, thus increasing the intraspinal tension, will often solve the dry tap problem.

Prognosis.—Cases of intracerebral hemorrhage as a rule recover, because in those cases the hemorrhages are microscopic. Pial or subarachnoid or tentorial hemorrhages recover, provided the diagnosis is made early, the hemorrhage is not extensive and is not intraventricular, the infant is of sufficiently large birth weight, and treatment is instituted early. What about the ultimate fate of those recovered cases? My studies reveal that as those children grow up, they remain subnormal in height and weight up to puberty; the static functions, i.e., sitting, standing and walking, and the development of speech all occur late. I have found 5 per cent of cases of epilepsy among them, 5 per cent Little's disease, 7 per cent idiocy and imbecility, many cases of psychic infantilism, backward school children and potential candidates for the homes for imbeciles and idiots. In view of the great frequency of immature births, it becomes evident how important a subject this is and of what practical significance it is to the mother, physician, school teacher, eugenist, and even to the economist. Our efforts should, therefore, be directed not only to the care of the immature infant, but also more especially to the care and hygiene of the mother during pregnancy, prevention of maternal infection, correction of the anomalies of the birth passages before pregnancy takes place, delaying wherever possible the premature induction of labor and substituting for it the cesarean operation. This will allow the infant to remain longer in utero and be born sufficiently heavy and developed to withstand the dangers of cerebral hemorrhage and escape the sad fate to which the immature child is predisposed.

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(For discussion, see page 144.)

Hilarowicz: Operation for Inguinal Hernia of the Adnexa, Zentralbl. f. Chir. **55**: 2881, 1928.

Hilarowicz calls attention to a special type of inguinal hernia in the female in which the sac contains the ovary and in which reduction of the ovary into the peritoneal cavity is attended with a good deal of difficulty. This difficulty is attributable to the fact that in some of these herniae the ovary does not lie within the true sac but occupies a position comparable to the cecum in a sliding hernia. For these cases the writer recommends opening the sac and then wrapping it around the ovary much as one does in the Winkelman operation for hydrocele, or as one does for the cure of cecal sliding hernia. With this procedure the ovary is easily replaced into the abdominal cavity and the hernial defect closed by the method of Bassini.

SEELIG.

APPENDICITIS IN PREGNANCY*

By Archibald L. McDonald, M.D., F.A.C.S., Duluth, Minnesota

THE following experience stimulated this paper. A colleague telephoned concerning a patient at full-term pregnancy with acute appendicitis, for whom he proposed cesarean section and appendectomy. Two objections at once presented—obstetrical: cesarean section for cause other than dystocia should be avoided if more conservative method of delivery is available; surgical: an acute abdomen with probable peritonitis is an unfavorable field for hysterotomy.

Mrs. G., 21 years old, para ii, gave a history of attacks of pain and vomiting previous to and earlier in this pregnancy. For two days there had been severe colic, vomiting, fever to 101° F., leucocytes 18,000. During last twelve hours condition was progressively worse; pain was more constant and severe, suggesting impending labor, vomiting persistent and distressing, fever higher, leucocytes 22,000. Examination: patient anxious, in marked distress, vomiting fecal in character, uterus at full term and in a state of hypertonus with no definite relaxation or contraction. Vaginally: head floating, membranes unruptured, cervix soft and thin, admitted one finger. Diagnosis: acute appendicitis with peritonitis, labor impending. Surgical indication for immediate appendectomy and drainage unmistakable. Labor being imminent, it was decided first to empty the uterus by the most conservative method possible. Under ethylene anesthesia the cervix was dilated manually, and a full-term, living child was delivered by version and extraction, followed by spontaneous expulsion of the placenta. There were no lacerations. The abdomen was then opened by a right rectus incision disclosing free purulent fluid. A gangrenous appendix lying between coils of intestine close to the uterus was removed. Cigarette drains were placed in the pelvis and to the cecum. The entire procedure required less than an hour. Convalescence was uncomplicated; drains were removed on third day. Mother nursed her baby throughout. Both were discharged on the fourteenth day.

The result was entirely satisfactory. Search of the literature, however, discloses a number of radical proposals. DeLee[1] has practiced and recommends cesarean section and appendectomy in acute attacks. The same procedure and also hysterectomy in badly infected cases have been carried out by various foreign authors (Fritz Michel,[2] G. Conrad,[3] Pankow[4]). Vaginal cesarean section has been done preceding abdominal operation for gangrenous appendicitis (Otto Wolfring,[5] Rosenthal[6]).

Acute suppurating appendicitis late in pregnancy or with impending labor is not common. While ten fellows[10] of this association state they have never met it, accurate data concerning 33 well-defined cases have been furnished by other members. From the literature, 37 well-described cases have been added. Emil Jerlov[7] has studied the en-

*Read at a meeting of the Western Surgical Association, Chicago, Dec. 14, 1928.

tire experience, with this condition, in 22 Swedish hospitals over a period of twenty years, and furnishes valuable information.

On the basis of data thus derived, three questions are presented.

1. To what extent does pregnancy modify the course, complications, and prognosis of acute appendicitis?

2. To what extent is either abortion or labor a factor in the complications and course of the disease?

3. To what extent do these considerations modify the surgical treatment of acute appendicitis and justify radical procedure to terminate the pregnancy or to empty the uterus?

There are conditions during pregnancy which may have untoward effect on the course of appendicitis.

1. Recurrent attacks are claimed to be more frequent than at other times because of constipation, stasis, and displacement of the cecum. Jerlov finds 96 cases with a positive history of previous attack, 109 with a negative history, and 59 with no data. Portes[8] quotes 16 instances where acute appendicitis had cleared under medical treatment, of which 11 developed an acute recurrence during the next pregnancy. Brindeau[9] and others discount this factor.

2. Displacement of the cecum by the enlarging uterus is given serious consideration by some authors. It is denied much significance by Brindeau and Jerlov. While such displacement is of less importance than is frequently stated, it should be noted that unless held by adhesions the cecum and appendix are usually carried out of the pelvis by the enlarging uterus. They lie in the free peritoneum. Therefore pelvic exudate or abscess is rare, certainly in advanced pregnancy.

3. The omentum is lifted by the enlarging uterus. This together with the high position of the appendix favors diffuse peritonitis rather than localization by protective adhesions as at other times.

4. Spread of infection through communicating lymphatics to the right fallopian tube and endometrium has been described. This may be an occasional cause of septic endometritis or abortion.

Serious complications are more frequent as pregnancy advances. After consideration of individual cases one may assert this is due to delayed treatment rather than to anatomic relations. Certain clinical conditions frequently confuse the picture and delay correct diagnosis until infection is far advanced. Nausea and vomiting are so common they do not attract adequate attention. Occurring after the middle of pregnancy, however, accompanied by local pain and tenderness, or with fever, these symptoms are significant.

While leucocytosis is said to be frequent, if exceeding 10,000 or if increasing, it should receive proper consideration. Pyelitis involving

the right kidney is a complication which may simulate acute appendicitis. In the literature several of the worst cases had been treated for some time as pyelitis, and the true condition was recognized only after diffuse peritonitis was present. Pyuria or bacilluria do not necessarily clinch the diagnosis of pyelitis. Hypertonic contraction of the uterus is a frequent result of peritoneal irritation (Lemeland[10]). It causes diffuse abdominal pain and suggests impending abortion or labor to the degree that nothing else is suspected.

The relative frequency of serious complications of appendicitis in the pregnant woman as compared with the nonpregnant woman is shown by comparative figures. With regard for varying judgments of different authors, I have taken the classification of Quain[11] and compared it with two series in the pregnant: that of Jerlov's 204 cases confirmed by operation, and the Western Surgical group of 33 cases combined with 37 from the literature.

	CONFINED TO APPENDIX		WITH ABSCESS		GENERAL PERITONITIS	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Quain, 1000 cases nonpregnant	551	55	289	28.9	160	16
Jerlov, 204 cases pregnant	108	45	45	20	51	25
Western Surgical group and literature, 70 cases pregnant	35	50	6	12	29	39

These figures show a comparative increase in the frequency of general peritonitis and decrease of local abscess as complications.

The comparative mortality is shown in the following table:

	CONFINED TO APPENDIX			LOCAL ABSCESS			GENERAL PERITONITIS		
	NO.	DIED	PER CENT	NO.	DIED	PER CENT	NO.	DIED	PER CENT
Jerlov, 204 cases pregnant	108	0	0	45	9	20	51	16	31
Western Surgical group and literature, 70 cases pregnant	35	1	3	6	3	50	29	8	27
Total, 274 cases pregnant	143	1	0.71	51	12	23.5	80	24	30
Quain, 1000 cases nonpregnant	551	2	0.36	289	7	2.4	160	18	11

The mortality of complicated cases in pregnancy is relatively high, especially when operated late in the attack.

To what extent is abortion or premature labor a factor in the complications and course of acute appendicitis? The following table shows the frequency of this event in various types of the disease.

	CONFINED TO APPENDIX			LOCAL ABSCESS			GENERAL PERITONITIS		
	NO.	ABORTED	PER CENT	NO.	ABORTED	PER CENT	NO.	ABORTED	PER CENT
Jerlov, 204 cases	108	16	13.8	45	25	55	51	32	63
Western Surgical group and literature, 70 cases	35	4	11.4	6	4	66	29	21	72

The above-mentioned figures indicate that the liability to abortion increases directly with the duration and severity of the appendicitis. In some of the more serious cases termination of pregnancy occurred before operation, proof that it was due to the disease rather than to surgery. The complication is of some prognostic significance.

There are factors predisposing to bring on interruption of pregnancy: (1) Fever and toxemia, as in pneumonia or influenza; (2) Gastrointestinal disturbances of themselves are not important; (3) Reflex irritation from peritonitis causes hypertonic contraction of the uterus. This results in painful uterine spasm. While this contracture may go on to active expulsive contractions, the hypertonus often persists as such, for several days. (4) Extension of infection through communicating lymphatics to the right fallopian tube and endometrium may cause death of the fetus and abortion. In 57 cases of appendicitis complicated by abortion Jerlov found 12 with salpingitis of the right tube. (5) Operative manipulation adds little if anything to the danger of abortion provided the stability of the pregnancy is not already disturbed. Early operation is the best safeguard. Spinal anesthesia is contraindicated, Brindeau et Juge.[12] It causes undue relaxation of the cervix. Postoperative complications of the ordinary sort may have some untoward influence and must be controlled.

The direct harmful effect of abortion or labor has been much exaggerated. This effect might be due to shock from prolonged labor, to excessive bleeding, to absorption and sepsis through the placental site or lacerations, or to disturbed relations in the abdomen. Jerlov concludes: in mild cases with no peritonitis, labor and involution whether premature or full term have no harmful effect. In cases with peritonitis delivery, whether preceding or following operation, has some harmful effect. He gives the following figures:

	ABORTED	DIED	PER CENT	NO ABORTION	DIED	PER CENT
Early General Peritonitis	10	1	10	15	0	0
Late General Peritonitis	19	12	63	7	3	43
Late Abscess	24	8	33	21	1	4.8

The mortality is higher in the cases which aborted. This does not prove that abortion is the chief determining factor in the result, because extensive peritonitis and sepsis were also present. Study of many of the cases in my data indicates that abortion or labor occurred in persons already prostrated by sepsis and had but little influence in the untoward result. This could have been avoided by earlier surgical intervention rather than by interruption of pregnancy. Many of them aborted because they were dying; they did not die because they aborted.

To what extent does the danger and possible untoward influence

of abortion or labor modify the indications for surgical treatment of acute appendicitis, or justify radical measures to empty the uterus? The dangers and complications of appendicitis in the pregnant woman are those of the same condition in the nonpregnant, plus a confused clinical picture, delayed diagnosis, and liability to general peritonitis rather than localization. Therefore, pregnancy increases the urgent indication for prompt simple surgical intervention with the following precautions: avoid spinal anesthesia, avoid unnecessary manipulation of pelvic structures of the uterus, ovary, or corpus luteum. Prevent postoperative disturbance by enterostomy when indicated or by sedatives. In early uncomplicated cases promptly treated the danger of abortion or labor is slight and requires no special consideration. Should either ensue, the complication can be effectively and safely handled by the vaginal route. Abdominal hysterotomy offers no advantage. In none of the Western Surgical group of localized cases was hysterotomy done.

With extending peritonitis or abscess the liability to abortion or labor increases, and a large percentage of those patients who abort will die. Can radical termination of pregnancy relieve the load? Not at all, unless the complication is already impending. In this event prompt evacuation of the uterus will avoid prolonged labor and possibly loss of blood. If it is known that the uterus or its contents are infected, hysterectomy might be expected to remove a focus of infection. However, this is a desperate procedure for a condition already nearly hopeless.

Delivery by abdominal section is rapid, spectacular, and only too popular in present day practice. For the condition under consideration it has a number of overwhelming contraindications. In an infected peritoneum the danger of spread of sepsis to the uterus and placental site is serious. Firm healing of the uterine wound cannot be assured; it presents the danger of rupture of the uterus in subsequent pregnancy. In many instances the child is dead or premature or not viable. Obstetrically, it is highly objectionable in young women with no permanent dystocia. I can find no justification for abdominal hysterotomy unless labor is imminent and there is actual dystocia which prevents vaginal delivery.

When either abortion or labor is impending, whether at time of operation or during convalescence from appendicitis, there are definite advantages in rapid termination by the vaginal route. In skilled hands this can be safely and effectively accomplished by manual dilatation of the cervix or by vaginal cesarean section, followed by version and extraction, or by forceps. This will avoid prolonged labor and loss of blood. It will not add materially to extension of infection. If delivery can be delayed till convalescence from the acute process is well advanced, the prognosis will be improved.

CONCLUSIONS

1. Pregnancy as a complication of acute appendicitis presents problems for differential diagnosis but does not modify the indications for surgical treatment.

2. Abortion or labor gives a relatively grave prognosis. Obstetric procedures are indicated only when the event is actually impending.

3. Delivery should be completed by the most conservative method consistent with good practice.

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Lyceum Building.

Sharlit, H., and Lorberblatt, I.: Chemical Test of Blood for Sex Differentiation, J. Lab. & Clin. Med. **14:** 119, 1928.

The blood stream of animals contains chemical units produced by the individual organs of internal secretion. On this basis, a chemical test for sex differentiation seems possible. By means of a modified quantitative Manoilov technic, readings based on colorimetric changes were made. In the original technic, the end-result of a test on an extract of male origin, resulted in a colorless solution, of female origin in solutions ranging in color from pink to red or violet. Tests were made on whole citrated blood and urine.

It was found that the end-results of the tests on blood, distributed themselves equally on both males and females. The sex of the donor, therefore, had no influence on either the Manoilov technic or its modification. The urines of more than 100 women were tested at different times, and a number of specimens were also obtained from the same individuals. The variations in the readings covered the entire range of color in the standard tubes. Chemically, the test is probably an oxidation reaction which in some cases is inhibited and in others may go to completion. No single chemical substance is required to play the part of inhibitor and it is unlikely that the same substances in blood or urine are being obtained. This test is probably not a specific one; the work requires further study.

W. B. Serbin.

REPORT OF CASE OF MEDULLARY CARCINOMA OF THE OVARY

By Jacob Sarnoff, M.D., Brooklyn, N. Y.

(Attending Surgeon, Brownsville and East New York Hospital; Associate Surgeon, United Israel Zion Hospital, Brooklyn, N. Y.)

Miss E. G., fifteen years old, occupation lamp shade worker. Past history negative. Menstruation began at thirteen, regular every four weeks, lasting about seven days, no pain. About one year ago she missed one period. Her last regular period was September 13, 1927. On October 24, 1927, the family physician, who is related to the patient, requested me to see her in consultation and ascertain as to the possibility of pregnancy which he suspected. The chief complaint was a gradual increase in the size of the abdomen during the past year, the size now appearing to be that of a full-term pregnancy. She also had occasional attacks of vomiting.

Physical Examination.—Patient anemic, showed evidence of loss of weight with marked prominence of her abdomen. Heart and lungs appeared to be pushed upward by the abdominal growth as evidenced by percussion and auscultation as well as x-ray findings. The diaphragm appeared to be on a much higher level than normal, being on the level of the fourth interspace in the anteroposterior view, the dome extending up to the same level on either side of the chest. The abdomen was greatly distended and quite tense. Indistinct areas of induration and softening could be felt through the abdominal wall, in certain respects suggestive of fetal parts. The abdomen was flat on percussion throughout except for slight tympany at its circumference at either flank and in the epigastric region.

The vaginal opening appeared quite patulous, admitting two fingers with ease. The uterus could be felt pushed back and pressed upon by an enormous tumor. The definite outline of the uterus, however, could not be determined owing to the marked intra-abdominal pressure.

Diagnosis.—The history of the case together with the physical findings as above outlined suggested an ovarian tumor.

The patient was admitted to the United Israel Zion Hospital the following day, October 25, and was kept under observation for twenty-four hours.

Operation was performed by the writer October 26. A median incision about six and a half inches long was made, extending from the symphysis upward to above umbilicus. The abdominal wall, especially the subperitoneal tissues, and peritoneum were edematous. The peritoneum was incised. Through the entire length of incision nothing but the surface of the tumor mass could be observed. It had a smooth, glistening appearance of a pearly whitish color with a pinkish tint. The tumor filled up the entire abdominal cavity. The intestines, the stomach and the liver were pushed aside, making it difficult to feel or see these organs. The tumor mass appeared ovoid in shape with its greatest diameter in the vertical axis of the body, the lower pole reaching the floor of the pelvis and the upper pole, the dome of the diaphragm. It was of semisolid consistency. The large omentum was found adherent both to its upper pole and anterior surface for an irregular area of about six inches square. These adhesions were separated and an effort was then made to deliver the tumor. It was not deemed advisable to introduce a trocar especially as the tumor did not appear to be of a cystic nature. By various manipulations the lower pole was finally delivered and then

the upper pole. Immediately the patient was placed in Trendelenberg position and extra-abdominal pressure was exerted by one assistant while the other held up the heavy tumor so as to ascertain its attachment. The tumor was found to be attached at the left broad ligament, its pedicle consisting of what appeared to be the utero-ovarian ligament, the Fallopian tube and the infundibulopelvic ligament. The thickness of the pedicle was about that of two thumbs making three-quarters of a twist in a clockwise direction. The tube extended from the cornu

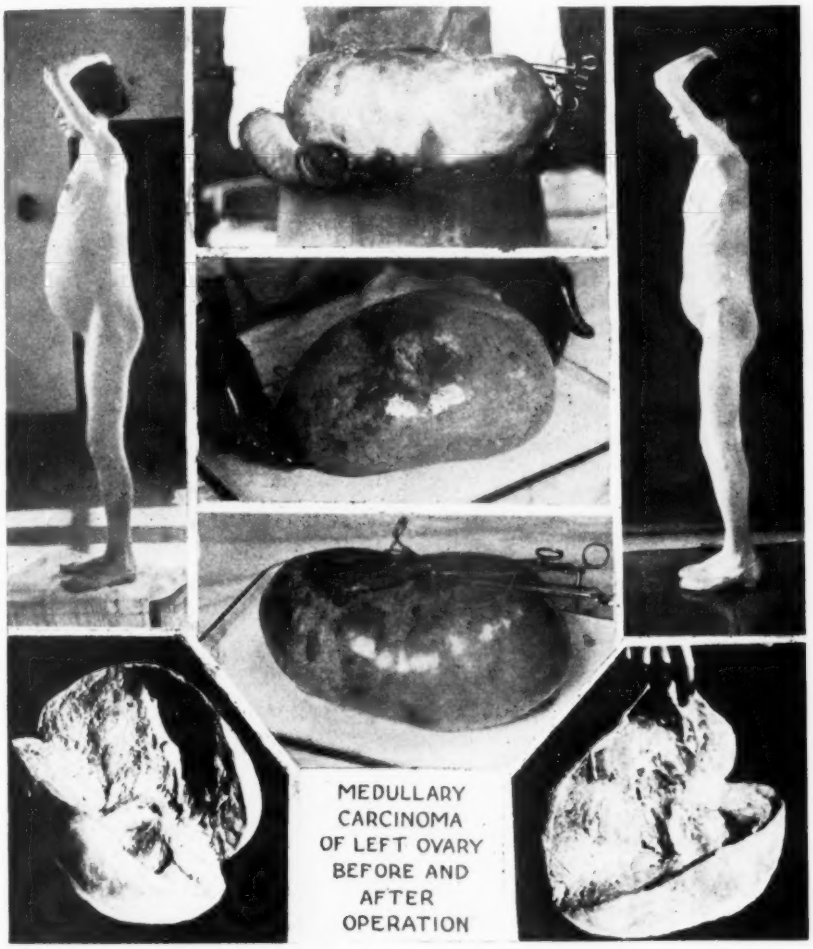

Fig. 1.

of the uterus for about six inches over the tumor mass, was very much swollen, edematous and about four times its normal size in all dimensions. The pedicle was untwisted and clamps were applied to it in two places, removing the tumor mass together with the outer half of the left fallopian tube. The stump of the pedicle was then ligated separately in three sections, not including the cut end of the fallopian tube. This cut end of the tube was left patent so as to preserve its normal function. The raw surface of the pedicle was peritonealized.

The right tube and ovary appeared to be normal. The uterus was of normal appearance. The omentum appeared inflamed and edematous with a few bleeding points at the site of separation from the tumor mass. The intestines appeared to be collapsed and pushed out of sight. They were brought down toward the pelvis and covered over with the large omentum. No evidence of any other growths or metastasis was found. The abdomen was closed, using a continuous chromic suture for the peritoneum, a continuous chromic for the fascia, which was overlapped, interrupted dermol suture for skin and fascia, and continuous dermol for skin. Operation lasted eighteen minutes.

A voluminous gauze dressing was applied to the abdomen at the line of incision, fixed by firm adhesive strips and a tight binder applied while the patient still remained in the Trendelenberg position.

The patient appeared to be in somewhat better condition than before the operation, the pulse being a trifle slower and of better volume. Nevertheless, a hypodermoclysis of about 800 c.c. of normal saline together with one ampule of ephedrin were given shortly after the operation. The postoperative course was uneventful. The day following the operation the pulse came down from 120 to 90. At no time was there any rise in temperature. The sutures were removed ten days following the operation. Wound healed by primary union except for a few drops of mucoid material which escaped from one of the angles of the suture line. The patient was up and about in twelve days.

Pathologic Report.—A description of the tumor mass as given by Dr. Goldzieher, pathologist of the United Israel Zion Hospital, is as follows:

The tumor as a whole looked solid, but the central portion showed some fluctuation, and on section a cyst was found at this place containing about one pint of slightly turbid yellowish fluid. The rest of the tumor consisted of a rather soft, yellowish pink tissue, mottled with darker red patches. The parenchyma of the tumor was very moist and fairly translucent, although occasionally more opaque areas could be seen. The structure as a whole was rather medullary, and the surface nowhere showed a granulated aspect.

Microscopically the structure of the tumor was formed by a multitude of small cells in rather loose connection with a distinct perivascular distribution. These vessels formed about the only stroma of the tumor. They were partly of capillary character, partly impressed as wide venous sinuses with a thin wall and but scanty connective tissue fibrils about their periphery. Occasionally a few round cells could be found in the adventitial tissue. No fibrils spread into the parenchyma of the tumor tissue. The looseness of the latter was apparently due to an excess of moisture. Some of the tumor cells still maintained their epithelial mosaic structure, while most of them were discrete. The latter type had a round cell body with hydropic vacuoles, while the former seemed to be polyhedral. The nuclei of the tumor cells were very irregular. Some were vesicular and poor in chromatine, others pycnotic and of quite irregular shape. Mitotic figures were common. Necrosis of many cells could be seen even within the otherwise viable tumor parenchyma. There were also quite extensive areas of complete necrosis.

The tumor described above is obviously a carcinoma and resembles somewhat the papillary carcinomas which are met with on the mucosa of the bladder. Similar tumors, however, are known to occur in the ovary. Both gross appearance and microscopic structure justify the assumption of a primary ovarian carcinoma.

The points of particular interest in this case are:

(1) *Pathologic Findings.*—A solid tumor of the ovary weighing fifteen pounds which proved to be a medullary carcinoma with hydropic changes. Primary solid carcinoma of the ovaries is quite rare. Only

15 per cent of all ovarian tumors are carcinomatous. The remainder are mostly ovarian cysts, fibroma or sarcoma, mentioned in the order of frequency. Very few indeed of these carcinomatous tumors are of the type of solid medullary carcinoma. Of the malignant tumors sarcoma is more frequent in the young, while carcinoma when it does occur generally takes place in those past middle age. This patient, however, is a young girl of only fifteen years.

(2) *Metastasis.*—In spite of the enormous size of this growth weighing fifteen pounds, no evidence of any metastasis could be observed in either the other ovary, the uterus or any of the abdominal organs. Metastasis is considered to be quite frequent in such cases.

(3) *Operative Procedure.*—It is advisable to put the patient in Trendelenberg position with the application of extra abdominal pressure immediately following the removal of such large tumors. The sudden release of the intraabdominal pressure is thus counteracted. An effort should be made in most cases to deliver the tumor in toto even though cystic and of large size without resorting to the use of the trocar.

Had the writer obtained a microscopic report of the findings at the time of the operation, he would have been loath even then to remove the uterus, right tube and ovary, all of which appeared normal. It appeared inadvisable to deprive a young girl, who has hardly passed the adolescent state, of theses organs even in the face of such malignancy. Should metastasis develop, it would most likely take place along the lymphatic route or via the blood stream which could hardly be avoided by the removal of the uterus and right adnexa. However, should she be fortunate enough to escape such metastasis, the preservation of the ovarian internal secretion as well as the reproductive function would be most desirable.

The result so far has justified this conservative policy. An examination of the patient in October, 1928, just one year following the operation reveals no evidence of any metastatic process. She appears to be in perfect physical condition, well developed and nourished, having her regular normal periods.

She weighed only 98 pounds just previous to her operation which would be equivalent to 83 pounds if we were to deduct the weight of the tumor which weighed 15 pounds. Her present weight is 130 pounds, an actual gain of 47 pounds in one year.

1406 Albemarle Road.

PERITONEAL IMPLANTATIONS OF OVARIAN CYST CONTENTS WITH DECIDUAL RESEMBLANCES

By Max Ballin, M.D., and Plinn F. Morse, M.D., Detroit, Michigan

THE following case illustrates a type similar to that already described by Sampson[1] (Case 14) in which endometrious implants underwent decidual changes as a result of pregnancy.

Mrs. H. F., aged forty-four, was referred to us for operation for a pelvic tumor. She gave a history of one pregnancy thirteen years previous, no miscarriages and regular menstruation every twenty-four days for three days. The last monthly period had been three weeks before this consultation. There were always pain and discomfort during the menstrual periods.

Patient was a well nourished woman weighing 142 pounds, pulse 84, blood pressure 120/80. Vaginal examination revealed a mass the size of the fist in the position of the right ovary, the uterus retroverted, cervix normal.

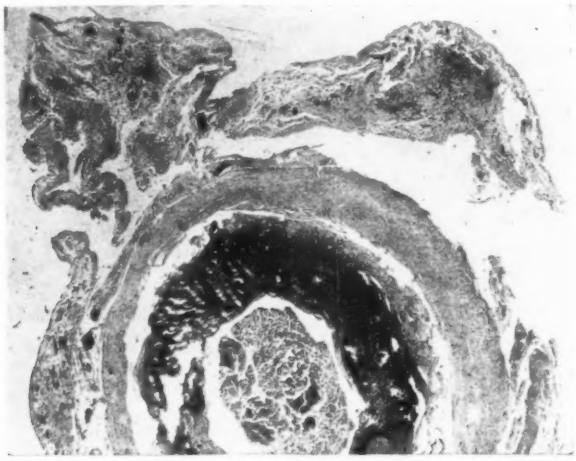

Fig. 1.—Implantations on peritoneal surface of appendix.

At operation we found a small amount of free bloody fluid in the abdominal cavity. The whole omentum was studded with brownish pigmented spots; the same condition existed along the peritoneal surface of the sigmoid, appendix and pelvic peritoneum. The spots varied in size and were in places confluent, producing a felt-like appearance of brownish red color looking as though patches of brownish-red plush had been glued to the peritoneal surfaces.

Both ovaries were enlarged. One measured about 3 by 4 inches with large, very adherent "chocolate cysts." The other contained an involuting corpus luteum. The sigmoid was involved in the adhesions.

Bilateral salpingo-oophorectomy and appendectomy were done, leaving a small ovarian stump on each pedicle, oversuturing the stump with the round ligaments, keeping the uterus forward.

Pathologic Report.—Gross examination: Material consisted of ovarian tissue, appendix, and small piece of omentum. The ovarian tissue included a large chocolate cyst about 8 by 6 by 5 cm. with a partially collapsed, flaccid wall, with a ragged opening in one end. The cyst wall was from 0.5 to 1.0 cm. thick. The cavity was lined by polypoid, partially organized reddish brown tissue resembling

organizing blood clots. Other pieces of ovary present the gross appearances of a recent involuting corpus luteum.

Microscopic Examination.—The small brownish excrescences which resemble endometrial implants consisted of particles of vascular granulation tissue containing large polygonal cells. The cells of this tissue were phagocytic and in part loaded with hematoidin pigment. The picture suggests that seen at the border of an involuting corpus luteum, the large cells resembling lutein cells.

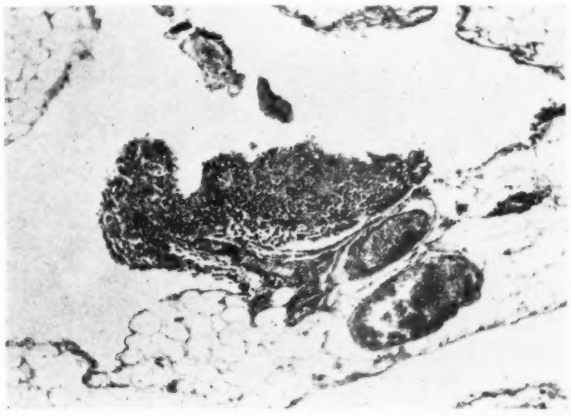

Fig. 2.—Omental implantation.

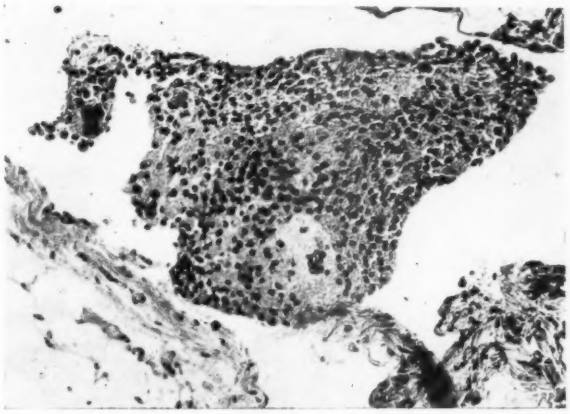

Fig. 3.—Omental implantation with large syncitial giant cell.

Masses of this character were found in the tissue removed from the omentum, (Figs. 2, 3, and 6) peritoneal surface of the appendix, (Figs. 1, 4, and 5) and the ovary.

More detailed examination of the implants from these locations revealed tissue resembling very vascular granulation tissue containing many wandering cells filled with hematoidin granules. The wandering cells were of various shapes and sizes varying from those of plasma cell type to large multinucleated giant cells and syncytial masses whose protoplasm was apparently continuous. Many of the cells were large with clear borders and resembled decidual cells. The tissue as a whole is reminiscent of decidua but not clearly identical with it. The picture

also resembled that found in the border of involuting and organizing corpora lutea after the rupture of the follicle.

The sections from the wall of the chocolate cyst showed a hyaline wall with partially organized blood clot on the inner border of the cavity. The large cells were in part filled with hematoidin and when surrounded by the young connective tissue and blood clot presented pictures resembling those seen in the sections from the peritoneal implantations.

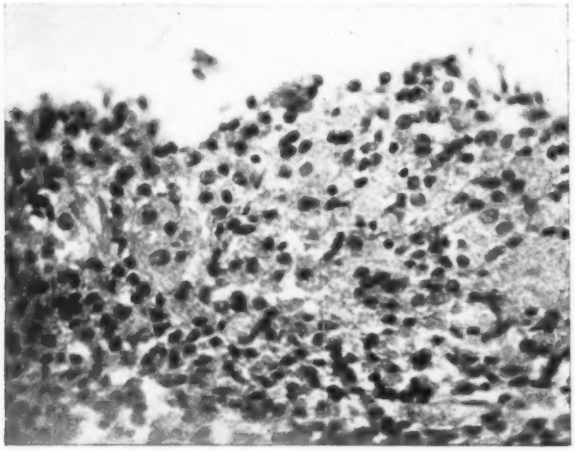

Fig. 4.—High power, implantation on appendix.

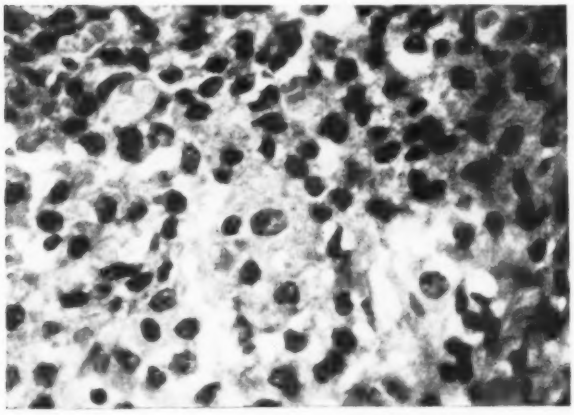

Fig. 5.—Appendiceal implantation. High power, showing large cells of decidual type.

The photographs are reproduced without retouching to bring out the resemblance to decidual tissue and at the same time to make the differences from decidual tissue apparent.

The low power appearances of our sections are much like those of Sampson's Case 14, but higher powers bring out certain important differences. Unfortunately the high power photograph of Sampson's case has been retouched leaving a doubt as to whether the decidual-like appearances might not have been accentuated. There seems no reason to doubt that the pictures presented by Figs. 71 and 72 of Sampson's article are true decidual reactions in ectopic endometrial tissue.

No clinical evidence of pregnancy was found in our case and moreover no true endometriomatous implants were found in any of the tissue removed. We were in doubt as to whether our case was actually the counterpart of Simpson's and felt that the implantations might represent organizing implanted lutein cells, until a few days later a specimen was found in the routine laboratory material which seemed to confirm the opinion that the peculiar picture found in our case also

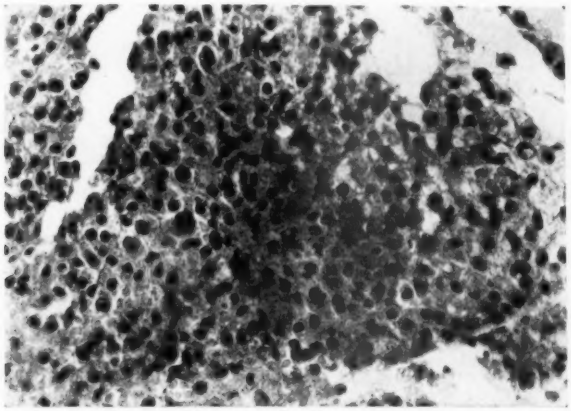

Fig. 6.—Omental implantation, showing decidual type of tissue.

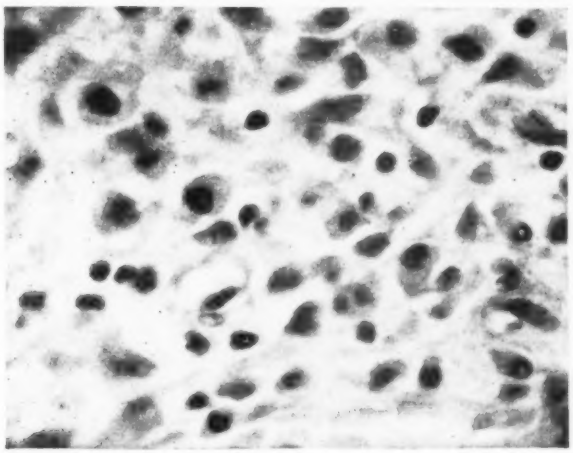

Fig. 7.—Organizing site of expelled tubal pregnancy, showing cells of decidual type.

was due to pregnancy. This was a fallopian tube from a case of recent tubal abortion in which the organizing remains of the site of implantation of the ovum presented the same picture as the peritoneal implantations in the previous case. These elements are well shown in Fig. 7.

REFERENCES

(1) *Sampson:* Am. J. Obst. & Gynec. 4: 1, 1922. (2) *Ballin:* Surg. Gynec. Obst. 46: 525.

Harper Hospital.

HYDATIDIFORM MOLE FOLLOWED BY NORMAL PREGNANCY AND CHILDBIRTH

By William B. D. Van Auken, M.D., Troy, N. Y.

FROM a study of over 50 articles on the subject, I could find but six cases reported where removal of the mole was followed by childbirth. Two of these cases were casually revealed during a discussion. It seems to me that normal pregnancy and childbirth are more frequent after hydatidiform moles than these figures would lead us to believe, due to the fact that many of the cases reported cured have no follow-up record and in all probability one or more babies were subsequently born to those mothers.

I am citing my case with a view to emphasize the more favorable aspect of this rather grave condition.

A twenty-four-year old, gravid ii para 0, married four years, engaged me for the care of her case on Sept. 30, 1926. She had inflammatory rheumatism in 1924, pneumonia 1910. One accidental abortion at the second month, in May, 1926. No diagnosis of mole was ascertainable. Menstruation began at eleven years of age, recurring profusely every twenty-six days without pain. The last period began July 23.

Physical Examination.—Weight 130 pounds. Height 64 inches. There were no demonstrable physical abnormalities other than a compensating mitral regurgitation and a trace of albumin in the urine with an occasional cast. Her pelvic examination and blood Wassermann also failed to show any abnormality. Her blood pressure averaged 128/90.

During August, September and until the ninth of October there was no menstruation or other discharge, but from the ninth until the twenty-third, there was a dark brown discharge. This did not reappear until the second of November, when it was red, later becoming brown and disappearing November 19. She required one-quarter of a grain of morphine during this period for pain which was apparently due to uterine contractions. I also gave her divided doses of sodium bromide. I did not detect any irregularities in the size, shape, or consistency of the uterus.

On December 21, 1926, after three hours of terrific labor, there was a spontaneous expulsion of a large part of the mole. I removed another medium sized piece digitally and gave her one c.c. of pituitrin. She made an uneventful recovery and called at my office regularly at six week intervals for the ensuing ten months. She had her normal menstruations during this time. She then became pregnant again. I watched her carefully through the antepartum period and there were no complications. She delivered a normal seven pound male with low forceps assistance, July 12, 1928. Both she and the baby made an uneventful recovery and are healthy and well today.

5 St. Paul's Place.

REPORT OF A CASE OF UTERUS BICORNIS UNICOLLIS*

By M. O. Magid, M.D., New York, N. Y.

EVERY now and then our attention is called to an anomalous development of the uterus, discovered most often accidentally either through abdominal operation or during the course of a routine examination. These patients usually have few symptoms pointing to the anomaly.

Mrs. A. C., twenty-two years of age, Italian, married three years, consulted me for the relief of sterility on April 9, 1927.

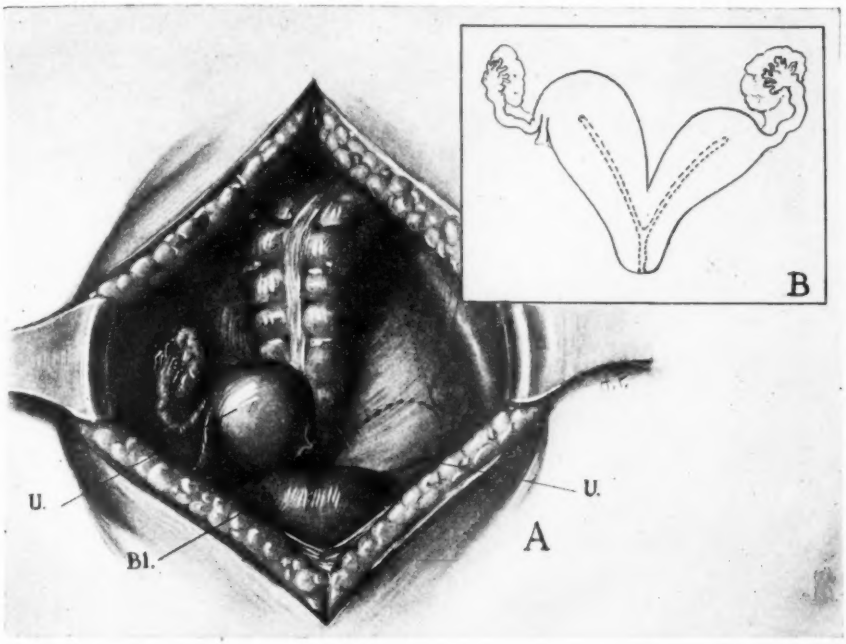

Fig. 1.—Showing relations of uterus to peritoneum, dotted outline retroperitoneal portion (*A*). *B* shows low bifurcation.

Menstruation began at eleven years, irregular, every four to six weeks, duration four days, moderate amount, no pain. Last menstruation, March 20, 1927. The general physical examination was negative. Gynecologic examination revealed a single vagina, small conical cervix, with a mild endocervicitis. The uterus seemed to be of normal size, retrocessed, freely movable, but placed slightly to the right of the median line. The right adnexa were palpable and tender. To the left side of the uterus there were two distinct masses, the inner one running obliquely, and attached to the uterus. To the left of this was the second mass of the shape and size of an enlarged ovary. The impression was that the patient had

*Presented at a meeting of the Bronx Gynecological and Obstetrical Society, November 26, 1928.

left adnexal disease. She had visited me several times between April 9, 1927, and October 24, 1927. During these visits I began to suspect that there was some anomaly in the genital organs. On the last date, the patient complained of severe pain on the right side of the abdomen, her last menstruation was August 6, 1927. Examination revealed no other findings than those previously stated. Because of the patient's abdominal discomfort and her feeling that something should be done for relief, I advised an exploratory laparotomy. The patient was admitted to the Hunts Point Hospital October 31, 1927. At operation the following conditions were found: The appendix was found to be long, retrocecal and bound down by adhesions. This was removed. On the right side a normal tube and ovary. The left side of the uterus was straight and smooth, no broad ligament, tube, or ovary was present. The rest of the pelvic cavity was smooth. The rectum was not in view. Knowing from previous pelvic examinations and

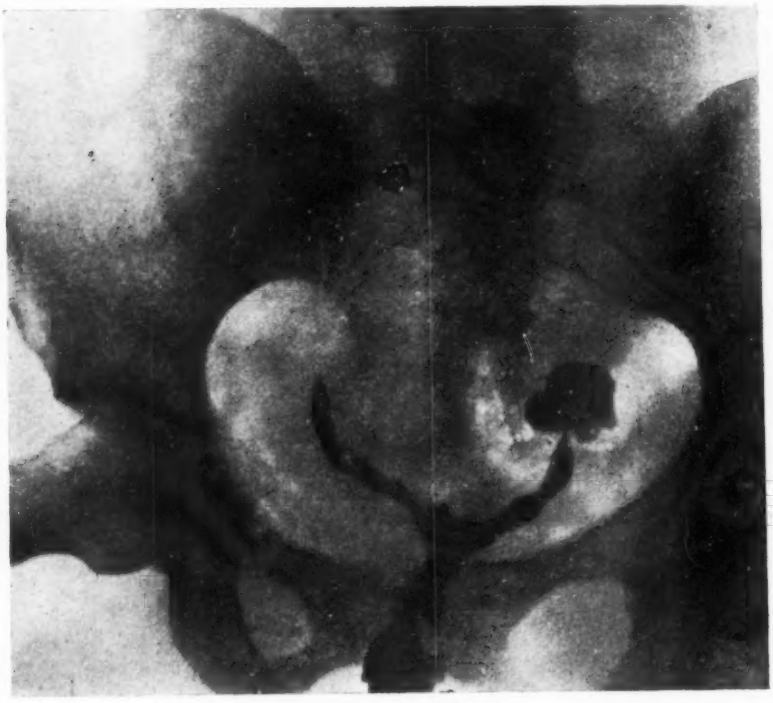

Fig. 2.—X-ray picture of injected uterus.

study of the case that there were other structures on the left side that were connected to the uterus, I began to palpate and found retroperitoneally, or extraperitoneally, a structure the size and shape of a uterus which was laterally and posteriorly placed to the uterus that was in view, but was attached to or fused with the cervix. At the upper outer end of this structure was the smaller and softer mass also retroperitoneally placed but it was attached to the firmer structure. Dr. M. Eisenstadt, who assisted me at the operation, palpated the structures, and we agreed that the retroperitoneal structures were uterus and adnexa.

Not having received permission to remove any of the organs, especially as there were no indications, I closed the abdomen. The patient made an uneventful recovery and left the hospital November 15, 1927.

On the follow-up visits January 28, 1928, and March 24, 1928, the patient stated

that her abdominal pains had entirely disappeared. Her menstruation appeared December 25, 1927, and January 22, 1928, and March 20, 1928. The amount at each menstruation was as usual, and the function was not attended by any pain.

On April 13, 1928, at the Hunts Point Hospital, I injected the uterine cavity with lipiodol and had an x-ray picture taken. This showed a double uterus with no single triangular body lumen as is usually found. There was present a low bifurcation.

The interesting feature of this case was the uterus bicornis unicollis, of which one-half was in the peritoneal cavity, the other half was retroperitoneal, or extraperitoneal.

982 Whitlock Avenue.

A METHOD FOR DEMONSTRATING THE MECHANISM OF LABOR

By Herbert Thoms, M.D., New Haven, Conn.

THE demonstration of labor mechanism with its interrelationship of the various cardinal and accessory movements has always been

Fig. 1.

a problem of the teacher of obstetrics. Medical students and nurses are apt to imagine these movements as more or less independent of one another.

The ideal method of illustration would be by means of moving pictures, but lacking this accessory, other means of demonstration must be resorted to. Figs. 1 and 2 depict a means of demonstration quite as adequate as that of the cinematograph.

The dried calvarium of an infant's skull fits easily over the folded fingers, and by movements of the wrist, the combination of cardinal and accessory movements may be demonstrated in a striking manner.

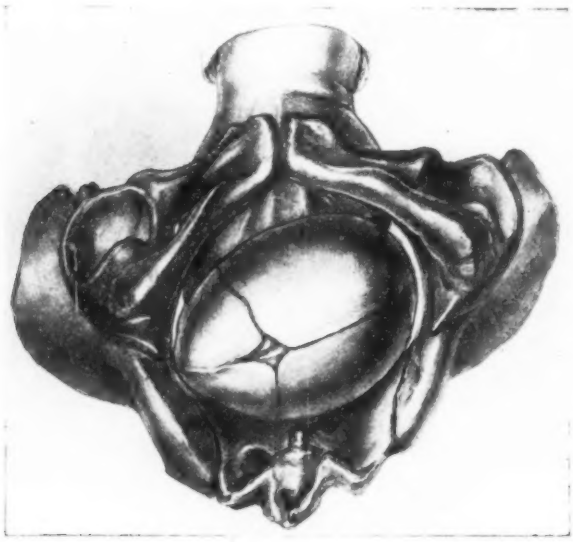

Fig. 2.

The importance of using a dried calvarium with well-formed fontanelles is obvious. The occiput and face are readily visualized by the student.

Flexion, descent, internal rotation, extension and external rotation in all vertex, brow and sinciput presentations may be shown in their correct interrelationships. The advantage of using simple apparatus in all teaching demonstrations needs no comment.

NEW HAVEN HOSPITAL.

TROWEL VAGINAL RETRACTOR

BY LOUIS RUDOLPH, M.D., CHICAGO, ILL.

THE importance of lacerations of the cervix in spontaneous deliveries is recognized. The current literature has brought out the importance of examining the cervix after delivery as a routine.

Most women are delivered in the dorsal position, and with the ordinary right-angled vaginal retractor it is difficult to secure proper retraction of the posterior vaginal wall because the shaft of the retractor

strikes the delivery-bed. Lateral retraction of the posterior vaginal wall is not satisfactory, because one must use two narrow vaginal retractors to secure proper exposure.

The trowel vaginal retractor (Fig. 1) was devised in order to facilitate the retraction of the posterior vaginal wall with the patient in the dorsal position and without putting the patient in stirrups, aided by a narrow, right-angled vaginal retractor for the anterior vaginal wall.

The trowel vaginal retractor consists of a blade 3¼ inches long and 2¼ inches wide. The shaft is bent 1¼ inches from the blade at an angle of 105 degrees. This blade is very satisfactory because it keeps the lateral vaginal walls from interfering with the exposure of the cervix. In this manner the shaft of the retractor is parallel to the

Fig. 1.

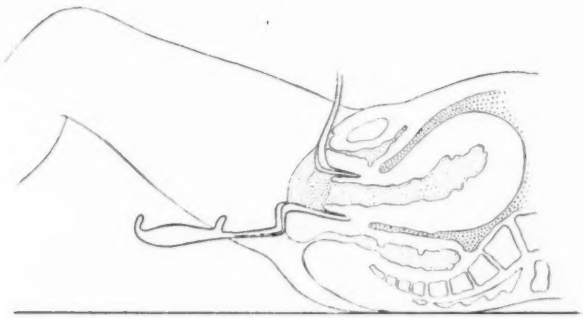

Fig. 2.

delivery-bed, and we can retract in a satisfactory manner without any inconvenience to the patient. (Fig. 2.)

After the exposure of the vaginal field the cervical lips are brought down with cervical forceps, and the whole circumference of the os externum is inspected and if lacerated can be quickly repaired without any change of the patient.

It is useful in spontaneous deliveries in which the uterus is felt to be firmly contracted, but vaginal hemorrhage is more than usual; in which case we suspect that the hemorrhage is due to a lacerated cervix or tears of the vaginal mucosa. Without placing the patient in stirrups the cervix and the vaginal mucosa can be quickly inspected and if lacerations are present can be easily repaired.

The instrument was made for me by V. Mueller and Company, Chicago, Ill.

55 East Washington Street.

A NEW RADIOGRAPHIC TABLE

WITH A DESCRIPTION OF THE AUTHORS' COMPLETE EQUIPMENT FOR PELVIC RADIOGRAPHY WITH IODIZED OIL AND PNEUMOPERITONEUM

By Irving F. Stein, M.D., and Robert A. Arens, M.D., Chicago, Ill.
(From the Michael Reese Hospital)

SINCE 1923 we have been investigating pneumoperitoneal methods of pelvic diagnosis, and in our attempts to obtain uniform and satisfactory results we have utilized various arrangements, postures, tilts, and different gases.

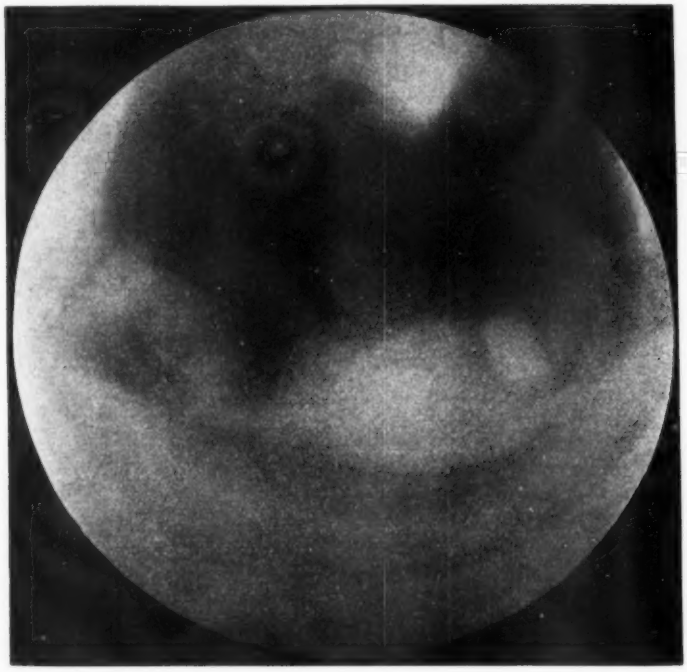

Fig. 1.

We found early in our work that the Peterson (partial knee-chest) posture was best suited for gynecologic diagnostic films, and with the added observations in five years' experience (about 400 cases with pneumoperitoneum) we still believe it to be the most satisfactory position. The films obtained after pneumoperitoneum with the patient in the Peterson posture reveal the pelvic viscera in their normal relationship, but inverted, and with the least distortion. (Fig. 1.) Contrary to the statements of other authors, the normal ovaries, fallopian tubes,

and round ligaments are usually seen as well as the uterus and bladder.

The Trendelenberg position is not as satisfactory because the organs may lie posteriorly against the rectum or sacrum and in this posture fail to appear completely upon the film. Posterior adhesions are thus also obscured. The gas must completely surround the viscera to obtain satisfactory diagnostic pelvic roentgenograms. The same objections hold for the lateral posture. When iodized oil is used alone in the diagnosis of obstructed fallopian tubes the Trendelenberg or even the dorsal recumbent posture will suffice. In the last two years of our work we have combined the use of pneumoperitoneum and iodized oil[2, 3] and

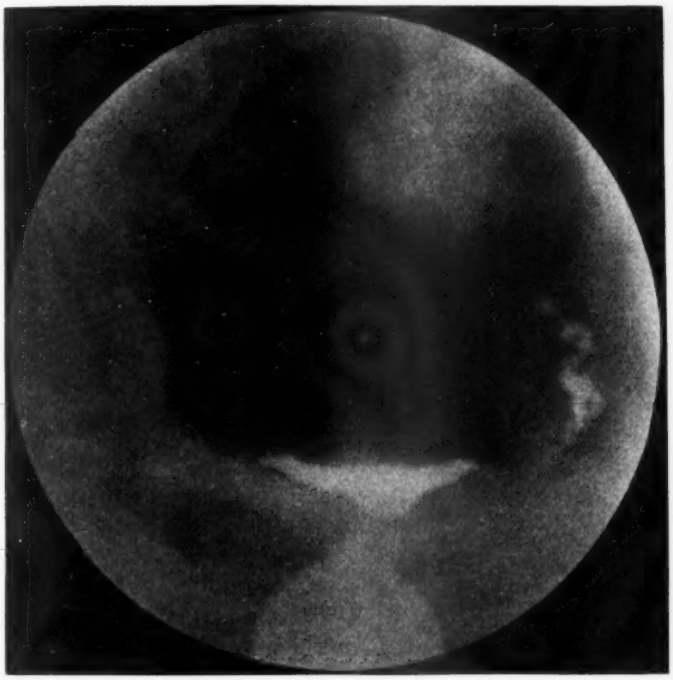

Fig. 2.

we are convinced that the combined method is of far greater diagnostic value than either of the aforementioned methods alone. (Fig. 2.) We have used this combination in 125 cases. The iodized oil serves as a contrast medium and is useful for outlining the uterine cavity and the lumina of the fallopian tubes, when open. It also provides a record of patency of the tubes when peritoneal spill is shown on the film. The phenomenon of spasm is also demonstrated with the aid of iodized oil.[4] By pneumoperitoneum, on the other hand, the size, shape, and density of the pelvic viscera are recorded, and such changes as adhesions, irregularities of contour, and differential swellings of the tubes and ovaries may be recognized. Various types of ovarian cysts can be dif-

ferentiated, providing they are no larger than grapefruit. We have films showing dermoids, lutein cysts, follicle cysts, malignant papillary cysts, and parovarian cysts which we can readily recognize one from the other.

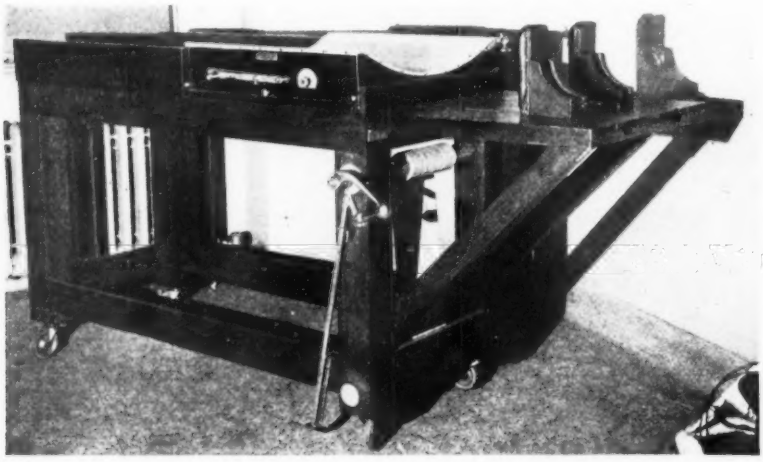

Fig. 3.

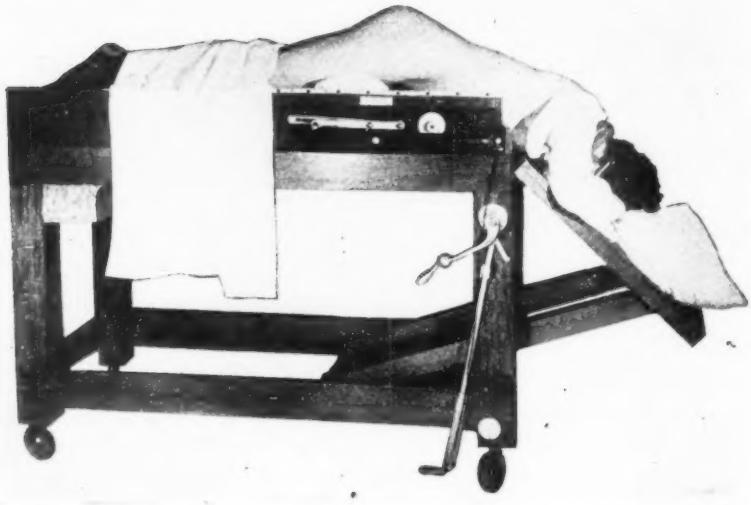

Fig. 4.

Carbon dioxide is used routinely by us for both transuterine and transabdominal inflation except in a selected group of cases in which oxygen is used. This group will be separately described later. Lipiodol is the preparation of iodized oil we employ. To facilitate the examination of the patient by our combined method, we have devel-

oped a new radiographic table (Figs. 3 and 4) and a new self-retaining cannula set (Fig. 5). The latter has recently been described.[5]

The table is extremely simple in construction. The mechanical arrangement is such that it cannot easily get out of order, and yet provides every position required for radiograms with the minimum of effort. An old, but satisfactory Bucky diaphragm is set into the head end of the table, and a movable leaf is attached to this end provided with adjustable shoulder braces. This leaf is controlled by an easy working crank, on a racheted cog so that even large heavy women are readily raised and lowered to the proper position. A pad is placed under the thighs, and a broad strap supports the knees so that they are not lifted from the table and thus alter the desired tilt. At the foot end of the table is a case into which a small CO_2 tank fits so that the operator may regulate the rate of flow during the patency test and at the same time watch the manometer on the wall opposite (Fig. 6.) The table is mounted upon large roller casters so that it can be transported from room to room or can be placed in a convenient corner when not in use. Brakes are also provided to render the table stationary for roentgenography.

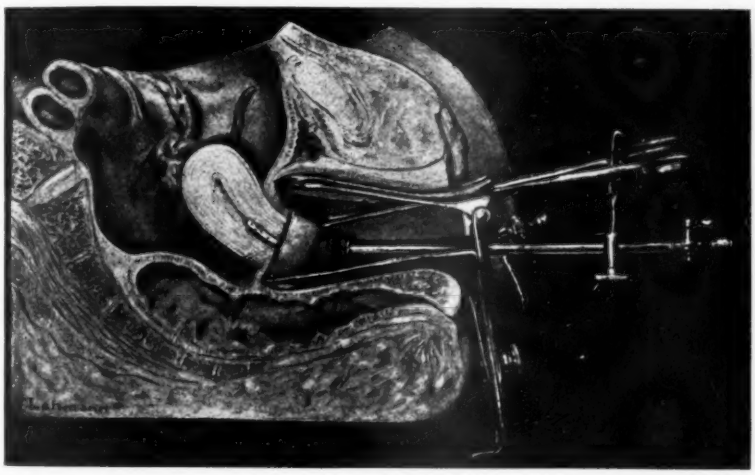

Fig. 5.

While these methods of investigation and diagnosis, separately or combined, are of chief value in sterility,[6] we have been interested in extending their use to other gynecologic conditions where the question of differential diagnosis is in dispute. We have in such cases often demonstrated how accurate the roentgen diagnosis may be, and have checked the result at laparotomy. The following case illustrates this point:

Mrs. H., aged forty, entered the Michael Reese Hospital on the gynecologic service of Dr. Stein on May 10, 1928, with the admission diagnosis of suspected ectopic pregnancy. She was a gravida x, having eight living children. One induced abortion was performed six and one-half years ago, but there was no history of infection following it. The youngest child was five years old. Her menstruation had always been regular, and the last period was March 22, 1928. She stained some-

what on April 5, and she bled again on May 5, and thought she was menstruating. There was no history of abortion. The patient did not suspect that she was pregnant. When she entered the hospital she was still flowing moderately, and she complained of a steady dull pain in the right lower pelvis.

Upon examination the uterus was found to be very little enlarged above the normal size, was rather soft, freely movable and in normal position. The left adnexa appeared normal, and a soft tender mass about 5 by 6 cm. was felt on the right side. A moderate amount of vaginal bleeding was observed, and a few clots passed. The blood examination revealed:

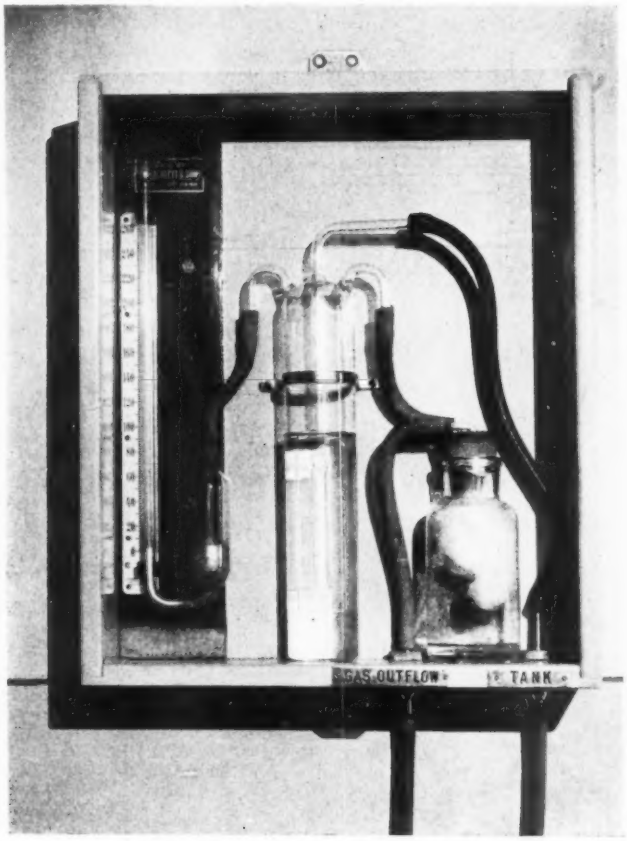

Fig. 6.

W.B.C. 13,200; R.B.C. 4,550,000; HB 75 per cent; Sedimentation: 17 min. Wassermann and Kahn negative, Urine: Albumin (Bleeding).

In the tentative diagnosis were considered: 1, incomplete abortion complicated by ovarian cyst; 2, right ectopic pregnancy; 3, hydatid mole; 4, corpus carcinoma.

It happened that while we were observing this patient a professor of obstetrics from a neighboring state visited us. We invited him to examine the patient and participate in the discussion of the diagnosis. Our guest diagnosed *bilateral ovarian cysts,* in which opinion one of our attending gynecologists concurred. Another of our staff independently corroborated our first diagnosis of unilateral cyst and recently gravid uterus.

In order to obtain additional information as a guide to the correct therapy, and to settle the obvious difference in opinion it was agreed to perform transabdominal pneumoperitoneum and study the pelvic roentgenograms. No iodized oil was used because of uterine bleeding and a questionable history of pregnancy. The result (Fig. 6) clearly settled two questions, namely (1) that there was but *one*, a right-sided swelling, and (2) that the swelling *was a cyst, and not an ectopic pregnancy.*

Because of the patient's multiparity, her age, her desire for sterilization, it was decided to perform laparotomy. At operation the right-sided cyst and slightly enlarged uterus were found exactly as shown in the roentgenogram. The uterus and right adnexa were removed and the normal left tube and ovary were not disturbed. The pathologic report was:

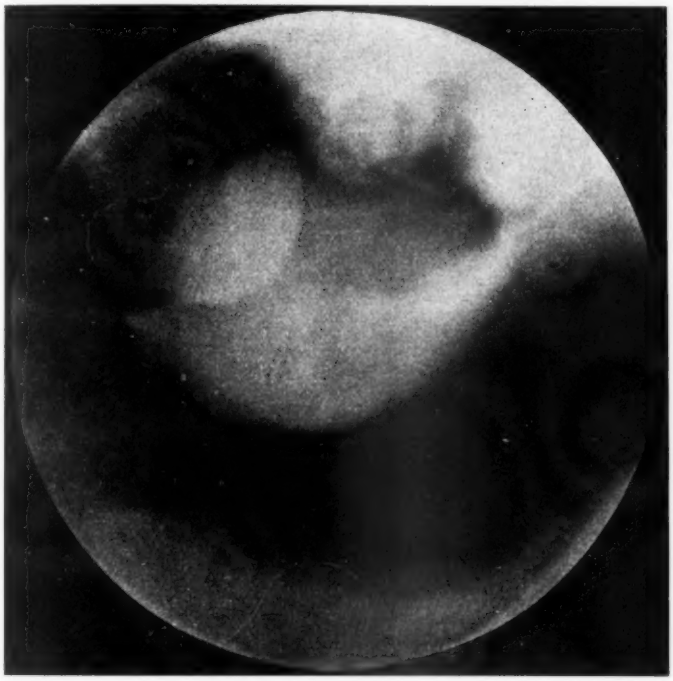

Fig. 7.

1. Early decidual reaction of pregnancy and acute inflammation of endometrium.
2. Fibrosis of myometrium.
3. Serous cyst and corpus luteum of ovary.
4. Accessory lumen of fallopian tube.

SUMMARY

1. We have described a new radiographic table for the satisfactory filming of female pelvic viscera with pneumoperitoneum.

2. We have developed an armamentarium, including a new self-retaining cannula set to facilitate this work.

3. Pelvic diagnosis is made more precise by the use of pelvic roentgenograms after pneumoperitoneum in cases of uncertainty.

4. The combined use of iodized oil and pneumoperitoneum is especially valuable in the study of sterility in the female and also affords a method of maximum diagnostic value in gynecologic patients, as an adjuvant to other means of clinical and laboratory diagnoses.

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Michael Reese Hospital.

PAPILLOMA OF THE NIPPLE

By William D. Fullerton, M.D., F.A.C.S., Cleveland, O.

(From the Gynecological Service, Lakeside Hospital)

EPITHELIAL newgrowths originating in the skin of the breasts are not frequently seen. When they do occur, malignancy being very rare, it is the differential diagnosis that is of chief interest to the physician, and their removal for cosmetic reasons, of primary importance to the patient.

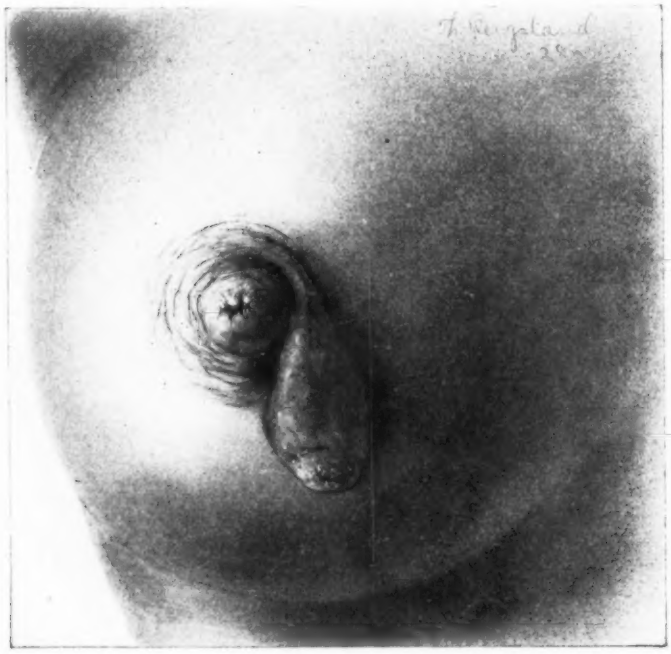

Fig. 1.—Smooth, pedunculated, slightly lobulated papilloma right breast. Pedicle cylindrical 4 mm. diameter. Maximum measurements of tumor 1.5 by 3 cm. Note similarity of tip of tumor to nipple.

The following case came under our observation: An unmarried woman, twenty-nine years old, presented herself stating that for many years she had had a growth which was gradually enlarging and becoming more pendulous. Examination showed a fairly well-developed woman, the right breast not quite so large as the left, both nipples well developed and erect, and with the exception of the tumor no other abnormalities discovered.

Attached to the areola of the right breast at its junction with the nipple in the upper inner quadrant was a slightly lobulated pedunculated tumor, the pedicle cylindrical in form, 4 mm. in diameter, gradually enlarging into the plum-shaped mass which measured 1.5 x 3 cm. (Fig. 1). The tumor was of the same consistency as the normal nipple, smooth of surface and similar in color to the areola. The tip of the tumor was considerably roughened and like in appearance to the top of the nipple. Sensation of the tumor was materially less than that of the nipple. There was no excoration or break in the skin and no secretion could be expressed or had ever been noticed.

Fig. 2.—Longitudinal section of papilloma of nipple, showing rather firm connective tissue core with irregular surface covered by stratified squamous epithelium which, though varying in thickness, everywhere maintains its normal relationship in its several layers to the underlying connective tissue.

The growth was easily removed under local novocain anesthesia, the pedicle being excised at its junction with the areola by means of an elliptical incision carried just through the skin.

Of principal interest was the differential diagnosis. Had we a simple papilloma, or was the growth an accessory nipple?

Section cut both longitudinally (Fig. 2) and transversely showed a moderately vascular, markedly branching firm connective tissue core covered by stratified squamous epithelium, which, though varying considerably in thickness, everywhere maintained the normal relationship of the several layers of the skin and of the skin to the connective tissue. There were no galactiferous ducts found in the cross-section of the connective tissue, nor were any sweat glands, sebacious glands, or hair follicles seen. The growth would therefore seem to be a simple benign papilloma of the nipple.

1510 Keith Building.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF DECEMBER 11, 1928

DR. L. S. LOIZEAUX (by invitation) read a paper on **The Cervix in Labor.** (For original article see page 57.)

DISCUSSION

DR. GEORGE W. KOSMAK said one point brought out was the question of the prophylactic treatment of these patients and by that means we ought to be able to cut down interference during the later portions of the labor. The tendency in obstetrics, unfortunately during recent years, has been entirely in operative directions; there has been a desire to terminate labor quickly, and a review of as many cases as the doctor has personally supervised is of value in showing that a great deal can be done by conservative methods. It is true he has advocated a number of procedures that perhaps to many of us may seem radical, namely, the cervical incisions. Dr. Kosmak formerly believed that that was probably the only outlet in cases where the cervix refused to dilate, but today no longer holds that view. He found atropine a drug of considerable value in these patients, and a combination of morphine and atropine will accomplish a great deal more than morphine used alone.

The presentation of a paper of this kind should be regarded as a plea for more conservative obstetrics. While Dr. Loizeaux did favor the more frequent resort to cesarean section, especially the low type of operation, he qualified it by stating that this should be in the hands of those specially qualified to carry it out, rather than a general recommendation which should go out from this Society to the practitioner at large.

DR. D. P. MURPHY (guest) said that in doing the work that he would present later he had met with a rather large number of cases of children whose mothers previously had had radium used in the uterus. In this group there has been a fairly large number of labors with dystocia due to a rigid cervix. A large amount of radium will produce scar tissue, so that in the cases where women are treated in the cervix with large amounts of radium, we may expect a dystocia due to scar formation in the cervix. That would mean that when a woman has had radium treatment, we may expect, if intrauterine irradiation has been done in the cervix, a difficult labor. It would also indicate in the case of fibroids or other bleeding, to place the radium as high in the uterus as possible, so that if the woman subsequently has a child it is possible to obviate the danger of scar tissue formation in the cervix.

DR. ELIOT BISHOP claimed that a proper knowledge of the physiology of the lower uterine segment was most important. The average textbook affords little information. This also applies to the clinical course and conduct of the first stage of labor. More cases of dystocia occur in the first stage than any other. Dr. Bishop felt that there was a fairly high percentage of operative interference in the series of cases presented by Dr. Loizeaux. However, we should read between the lines a little, and the doctor undoubtedly meant to convey the impression that a good

many of them came to him in consultation when they had already established their labor, and that makes a good deal of difference in management. They were not all under his control from the beginning.

Those trained by and under the late Dr. Pomeroy are of the belief that he knew much about the first stage of labor and what was happening to the lower uterine segment. Aside from Dr. Pomeroy's radical teaching of the 180° rotation in the case of a posterior position not going well and that to be done not too late in labor, he taught that most cervices, if given a chance, will take care of themselves. Sedatives are the things that count. However, after a rotation and further test of labor, if either the child or the mother shows signs of strain, Dr. Bishop did not hesitate to incise the cervix and extract the child. With an anterior position this is not such a formidable procedure.

DR. B. P. WATSON said there seems to be an analogy between the dystocia of the first stage where the patient has good uterine contractions without dilatation of the cervix with a good deal of pain, and cases of so-called spasmodic dysmenorrhea. The same factors are acting in each, namely, disorder and contraction of the uterine muscle. Whether there is a distinct sphincter at the internal os or not, this conception may help us to understand better some of the cases of dystocia.

In teaching students the importance of conservatism in the first stage of labor and the importance of patience, the teaching of the bipolar action of the uterus is of value, namely, that two things should be occurring in the uterus in the first stage of labor, an active contraction on the part of the uterus and a simultaneous relaxation of the region around the internal os and in the lower uterine segment. In some cases that does not occur; the bipolar action is absent and there is an irregular contraction or spasm in the lower uterine segment and in the region of the internal os, instead of a relaxation. It is in such cases that the administration of morphine does so much good. We all know the cases where the first stage is going on for a long time with no dilatation; morphine is given with the idea of giving the patient a rest, and we feel we will not be called upon by the patient for some time, but, to our surprise, we find within a short time of the administration of the morphine we are sent for because the head is beginning to come down on the pelvic floor.

DR. O. PAUL HUMPSTONE felt that a disturbed nervous balance more than anything else interferes with the complete dilatation of the cervix.

Dr. Loizeaux did not mention repeated doses of morphine. Sometimes after the morphine wears off there is a desire to go ahead and deliver when it might be well to repeat the dose of morphine and wait longer.

DR. LOIZEAUX (closing) said in regard to Dr. Kosmak's question as to the frequent use of incisions in the cervix, that he asked for more frequent *consideration* for multiple incisions. In 557 cases to use multiple incisions three times would scarcely be called frequent.

The question of incidence of cesarean section: there was one cesarean section in 17 cases, approximately, very frequent. The fact remains, however, that Dr. Loizeaux's work came from a small group of practitioners, many of them doing their own obstetrics, and only referring the difficult cases to an obstetric specialist. So, quite a number of cases were sent for section which would not have been sent if they were normal cases. On the other hand, the sections done in recent years have been practically all low sections after a real test of labor. He felt that we must reform or revise the statement of Williams to the effect that the "mortality in cesarean section is in direct proportion to the number of hours that the patient has been in labor," and he did not join in the pessimism of those who say that we should not have such a frequent resort to cesarean section.

Dr. Watson's remarks are very apropos. Atropine if effective in spasmodic dysmenorrhea will probably be effective in that type of spasmodic first-stage dysmenorrhea.

Dr. Loizeaux said he did not advocate dilatation of the cervix by the Harris method, but where vaginal delivery is imperative, to complete the dilatation by Harris' method under deep anesthesia. He preferred to deliver such cases with forceps because one can be more deliberate in slipping the cervix back over the head rather than by doing a version and yanking the cervix loose from its attachment and bringing it down to the perineum.

In regard to Dr. Humpstone's remarks and the point about the disturbed nervous balance: he believed in repeated doses of morphine, and in that connection referred to the statistics in the paper.

Waiting and expectancy in the first stage are essential, but once you have come to the conclusion that the case must be delivered, he did not believe in putting in bags and waiting for them to be expelled. Dr. Loizeaux said he was in favor of definite delivery once you reach a narrow margin of safety, and that was the point stressed in the paper. Of the 33 cases of cesarean section, in 14 of them cervical dystocia was a major element, but not the only major element. Some were toxic cases. No case was sectioned in the convulsive stage. Five cases were sectioned for toxemia which would have terminated in convulsions. Two had convulsions after delivery. No case was sectioned after a convulsion took place. Breech and toxic cases were treated conservatively. In the case of a live baby with a rigid cervix, where proper diet, elimination and hygienic measures have been instituted and the blood pressure is going up and the symptoms are getting worse, Dr. Loizeaux was not ready to give up section in that type.

STATED MEETING, JANUARY 8, 1929

Dr. Wm. T. Kennedy reported two cases of **Postoperative Tetanus.**

Case Reports

Case 1.—Mrs. M. B., referred to the hospital from the Out-Patient Department with a diagnosis of myoma uteri, October 9, 1927. Patient colored, aged forty-three years, nationality, American.

Chief Complaint.—Swelling of the abdomen for one year and heavy feeling in the abdomen for two months. Menstruation normal. Last five periods have been slightly less in amount. Last period November 22. Married twenty-five years, five full-term pregnancies, normal deliveries, no abortions. Pneumonia in 1922, otherwise history negative.

Physical Examination.—Height 5 foot 3 inches, weight 181 pounds. Blood pressure 158/86. Heart and lungs negative. Abdomen, tumor mass felt the size of an eight months' pregnancy. External genitals normal. Moderate laceration of pelvic floor. Normal multiparous cervix, negative for laceration. Uterus size of six months' pregnancy. Adnexa negative.

Urine acid, faint trace of albumin, few pus cells. Urine culture, *slight growth of staphylococcus.* R.B.C. 4,200,000. Hgb. 70 per cent. White cells, 7,000, polys. 68, lymph. 30 per cent, Trans. 1, Eros 1. Sedimentation time, 300 minutes. Wassermann negative for cholesterin and alcohol antigens, Type IV.

X-ray examination of abdomen showed no evidence of pregnancy.

Operation.—October 14, 1927. Hysterectomy, complete, salpingo-oophorectomy, bilateral, appendectomy.

Findings.—Uterus retroverted in the culdesac. The right tube and ovary normal. The left tube and ovary adherent in the culdesac. The uterus had on its anterior wall and to the right, a fibroid about the size of an eight months' pregnancy. This had drawn up the bladder over its anterior surface about 4 inches, thus thinning out the bladder wall. The appendix was slightly congested.

While separating the bladder from the fibroid it was found to be densely adherent and so highly attached to the fibroid that it was accidentally incised. This was immediately closed by a catgut suture. Retention catheter inserted at the end of the operation.

Pathologic Diagnosis.—Large myoma.

Patient was sent to the recovery room in fair condition. Twenty-four hours after operation pulse 100, temperature 101° (rectal), respirations 22. Temperature gradually dropped from 102° on the second day to 100.4° on the fifth day, pulse and respirations gradually dropping until the eighth day was reached. On the ninth day the rectal temperature rose to 102. On the tenth day the patient complained of marked stiffness of the muscles of neck and jaw. Stated that she had bitten her tongue while asleep. Scarcely able to swallow. Wound dressed and apparently healed and clean. The temperature rose to 103.6°, pulse 120, respirations 30. Diagnosis: Tetanus. Tetanus antitoxin was immediately sent for and the patient sensitized by the usual method; 7500 units tetanus antitoxin given intraspinally and 16,000 units given intramuscularly. The wound was opened for a distance of 3 inches along the incision and Dakin tubes inserted. Five hours later 15,000 units tetanus antitoxin given intraspinally and 32,000 units given into the abdominal muscles. B.P. 175/92. Twelve hours later 16,000 units intraspinally and 16,000 units given intramuscularly. Five hours later 12,000 units given intramuscularly. Blood transfusion, October 25, 500 c.c. Nineteen hours later 16,000 units given intraspinally and 16,000 given intramuscularly. Five hours later 16,000 units given intramuscularly. Four hours later temperature 106.2° per rectum, pulse 156. Patient had generalized muscular contraction, rigidity and reflexes remain unchanged. Patient given morphine. The condition remained good for four hours. Patient died on October 27, ninety hours after the onset of the tetanus. Cultures were made from pus and sutures from healed abdominal wound. Smear pus with many cocci, mostly diplococci, few bacilli. Agar slants in twenty-four hours showed staphylococci and thick gram positive bacilli with endospores. Stab cultures after 60 hours showed no tetanus bacilli, many cocci. Pieces from sutures together with pus were put into skin pockets on back of mice, none developed tetanus, one died from sepsis.

Autopsy Findings.—Diagnosis: Purulent peritonitis, cystitis, and parametritis. The pelvis was full of adhesions involving the parietal peritoneum, sigmoid, cecum and several loops of small intestines, containing pus fibrin and decomposed fat tissue. The culdesac was obliterated by pus containing adhesions. The bladder contained a small amount of reddish fluid, its mucosa swollen and cyanotic. Under the cervical stump about 10 cm. of thick green pus were found. A smaller mass of pus was found on the stump of the appendix. Ureters intact. Kidneys swollen. Left internal iliac vein thrombosed.

Comment.—In view of the fact that this patient had a purulent peritonitis with formation of pus, it is not fair to lay the cause of death to tetanus as it is quite possible this patient would have died from the condition present had tetanus not been also one of her complications. Hence, the treatment for the tetanus in this case would not account for her failure to recover.

Case 2.—Mrs. R. W. Admitted to hospital May 5, 1928, having been referred from the Out-Patient Department with a diagnosis of myoma uteri. Patient colored,

aged thirty-six, American. Chief complaint, irregular menstruation and general malaise for three months. Last regular period December, 1927, last period April 24, 1928. Married three years, two pregnancies, both induced abortions. Had a curettage at each time. Tonsillectomy, 1925. History otherwise negative.

Physical examination, height 5 foot 2 inches, weight 150 pounds, blood pressure 108/70. Heart negative. Lungs, coarse breathing. Nulliparous pelvic floor. Cervix normal. Uterus the size of three and one-half months' pregnancy.

Urine examination negative, sterile after twenty-four and forty-eight hours. Blood count 5,150,000 red cells, 100 per cent hgb., 10,400 white cells, polyps 63, lymph. 36, Blood Type II; Wassermann negative.

Operation.—May 11, 1928. Supravaginal, hysterectomy, right salpingo-oophorectomy, appendectomy, separation of adhesions. Findings: Multiple fibroids of the uterus. Uterus the size of a three months' pregnancy. Numerous irregular pedunculated myomas with adhesions between the intestines and uterus. Condition good at the end of anesthesia, although patient required an unusual amount of gas and ether induction and it was difficult to get the patient relaxed.

The wound healed by primary union.

Pathologic Report.—Myoma uteri. Lutein cysts of ovary. Normal appendix.

The patient had frequent emesis of free fluid in the recovery room. Patient was given calomel, 2 grains in divided doses, with citrate of Magnesia the following morning. Rectal temperature postoperative, highest point in first three days, 101.6°, pulse 110, respirations 24. Gradual fall in temperature. On the fourth day after operation patient was given acid sodium phosphate and urotropine alternately because she had a mild pyelitis. On the seventh day after operation, patient complained of her jaw being stiff and of her inability to open her mouth. Diagnosis of tetanus immediately made. Patient given 10,000 units of tetanus antitoxin intravenously and 10,000 units intraspinally. Six hours later 10,000 units intravenously. Twenty-two hours later 10,000 intraspinally and 10,000 intravenously. Three hours later 10,000 intramuscularly. Twenty-four hours later 10,000 intravenously, twelve hours later 10,000 intramuscularly. Twelve hours later 10,000 intravenously and six hours later same. Twenty hours later 10,000 intravenously. On each of the next days, 10,000 units intravenously. Following two days 20,000 intravenously each day. Following day 10,000 intravenously. Following day 20,000 intravenously. During the next seven days 10 doses each of 10,000 units were given, some intramuscularly and some intravenously. Patient was given morphine gr. ¼ once or twice each day and chloral hydrate gr. 20 and chlorotone gr. 20 about every eight hours, which was apparently sufficient sedative to keep the patient comfortable and to allow her to have some sleep. Fluids were given through tubes, the greater portion of which was milk with whisky. Patient had a colonic irrigation once a day. Total antitoxin given intraspinally 20,000 units, intravenously 170,000 units, intramuscularly 120,000 units.

On the seventh day the first convulsion appeared about eight hours after the diagnosis of tetanus was made. Another convulsion three and one-half hours later which lasted thirty seconds. Convulsions occurred at rather regular intervals but were of mild character excepting that patient on several occasions bit her tongue. On the tenth day after operation patient had a convulsion which lasted fifteen minutes followed by involuntary urination. On May 21 patient had a convulsion lasting three minutes and from this time on convulsions were more or less regular. On account of the fear of a long convulsion and a spasm of the diaphragm, chloroform and a mask were kept in the room so that in case the patient should become semiconscious this could immediately be used. On the fifteenth day after onset of tetanus, patient had a sudden spasm of the jaws when she bit her tongue. This was followed by a cough and by what seemed to be a mild convulsion. Pulse

became imperceptible. Breathing ceased for several seconds. Chloroform was administered. The following day patient seemed mildly irrational, which lasted until the following morning. Convulsion lasting several minutes again seized the patient. She became strangled on trying to swallow a little whisky. Chloroform anesthesia again given. Patient continued to take liquid food. One day later patient seemed slightly better, pulse 96. On the same day, in the afternoon, patient had a mild convulsion, when a feeding tube was inserted. At this time more chloroform anesthesia was given. From this time on apparently the patient began to improve. No more convulsions were noted. Patient began to sleep normally and there was a relaxation of the muscles of the jaw. On the twenty-third day after onset of the disease patient began to walk across the floor of the room. On the thirty-fourth day after the onset of the disease she was discharged from the hospital in excellent general condition. Some slight stiffness of the masseter muscles only.

From our observations one should draw the following conclusions:

1. That immediate establishment of the diagnosis be made.

2. That tetanus antitoxin should be given immediately, 10,000 units intraspinally and 10,000 units intravenously. This should be repeated on the following day; 10,000 units should then be given intravenously until the subsidence of the disease.

3. That sufficient sedatives should be given to keep the patient at rest.

4. That the patient should be supplied with sufficient water, nourishment, etc., to keep up her physical requirements, either by mouth, rectum, intravenously, or hypodermically.

5. That a nurse should be constantly in attendance to care for the patient in convulsions and in spasms.

6. That chloroform and an anesthetic mask should be kept constantly in the room in order that a general anesthetic may be administered at any time when a spasm of the diaphragm sets in. Such anesthesia may tide the patient over the crisis.

DISCUSSION

DR. JOHN O. POLAK said he had observed six cases of tetanus, and in looking up the literature was impressed with the fact that in the majority of cases a removal of the appendix had been done. In his six cases the appendix was removed. This is another point in favor of the stand Dr. Polak had taken for a considerable time, namely, that it is dangerous to remove the appendix when there is no pathology there, and that it subjects the patient to an unnecessary risk.

If iodine destroys the tetanus bacillus, why not drop the cautery in removal of the appendix and go back to cutting them off and using iodine, because it is quite certain that tetanus is a complication that has its origin in the intestinal canal, hence the danger to these women is increased in those cases where the appendix is removed routinely.

DR. I. C. RUBIN asked whether Dr. Kennedy had noted any tetanus which followed an operation upon the vagina, anterior or posterior colporrhaphy. Dr. Rubin recalled one case of fatal tetanus which developed on the fifth or sixth day after a plastic operation which was done by a house surgeon, and death followed in three or four days. The one thing of significance in the case was that the sutures had been demonstrated to have been inserted through the rectum in doing the posterior plastic part of the operation, and probably the tetanus bacillus was dragged in, in that way.

DR. W. T. KENNEDY said he had not noted any case that had a plastic operation and developed tetanus. In answer to Dr. Polak's remarks, he said he had not the exact ratio of the figures, but found that more tetanus developed in those patients who had not had their appendix removed than in those who had.

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF OCTOBER 4, 1928

DR. AARON CAPPER (by invitation) read a paper on **Cerebral Birth Hemorrhage in Premature and Immature Infants.** (For original article see page 106.)

DISCUSSION

DR. JACOB WALKER said that the obstetrician ofttimes fails to appreciate his responsibility to this matter, as his efforts are largely spent in the investigations of the toxemias, operative procedures, lessening of morbidity and mortality rates, and thereby relegating the welfare of the infant upon the shoulders of the pediatrician.

Dr. Capper emphasized the particular risks of intracranial hemorrhage in premature and immature infants, due to the fact that the blood vessels are readily torn and injured, but many cases of intracranial hemorrhage undoubtedly occur in full-time babies, of normal weight, and in those whose skulls are somewhat ossified.

Dr. Walker believed that it is possible to prevent or lessen the tendency to intracranial hemorrhage and its latent consequences in premature and immature and even full-term babies, but the subject must be considered in three phases:

First.—The birth of premature and immature infants may be avoided by proper antenatal care, by laying stress particularly on the prevention of the toxemias of pregnancy, and by the treatment of specific conditions in the mother. Another point of importance is the abstinence of marital relations in the last months of pregnancy, as this may be a cause of prematurity in a great many cases.

Second.—What can we do in the actual process of parturition to lessen the tendency to intracranial hemorrhage? A premature or immature baby should not go through a long labor, as this produces definite etiologic factors which predispose the intracranial tissues to more extensive damage. Such labors can be terminated by the proper application of forceps and the use of episiotomy, so as not to permit the premature and immature fetal skulls to undergo unnecessary pressure from strong uterine contractions and a rigid pelvic floor.

Long labors predispose to intracranial hemorrhage, especially those cases in which the membranes have been ruptured for some time and where a marked caput is forming or where the cranial bones are greatly compressed and are beginning to overlap excessively. These cases are best terminated by forceps and episiotomy. Particularly should the second stage of labor be shortened. Ofttimes intracranial hemorrhages have been blamed on forceps, but in reality it was due to long labors where, as a last resort, forceps were used. Definite cases of disproportion should not be permitted to go into labor, and in those cases where the disproportion is questionable, after a proper test of labor, a cesarean section either classical or the low type, would be far more preferable for the welfare of the child than a high forceps.

In breech deliveries and version, especially in primigravida, there would be less likelihood of hemorrhage from the application of Piper forceps than from manual extraction and the ofttimes excessive pressure made from above.

In order to lessen the tendency to hemorrhage one must be alert in preventing asphyxia in infants, as that leads to intracranial hemorrhage by producing marked intracranial venous stasis. This can be done by paying strict attention to fetal heart tones.

Third.—A very important routine duty of the obstetrician will be to include a careful examination of the newborn baby, a duty which most of us fail to observe, although not intentionally, depending a good deal upon the information we receive from the nurse in charge of the nursery, as to the welfare of the infant. This is not so important in the ward baby because the well-regulated maternities have their nurseries in charge of pediatricians, but when it comes to our private patients we should include careful observation of the baby's behavior, especially in the first days of its life, thus recognizing cases of hemorrhage before they reach the stage of convulsions, such as Dr. Capper describes. The more modern nurseries are doing coagulation time, ophthalmoscopic examination and even spinal puncture. These factors tend to reduce the unrecognized cases of cranial hemorrhage.

DR. HARRY STUCKERT asked whether the hemorrhagic diathesis is a contributing factor to the etiology of the hemorrhage under discussion.

Since cerebral hemorrhage at birth is by no means uncommon, it would seem that these infants should be kept under close observation until such time as the possibility of hemorrhage occurring can be excluded. During the last three months at the Jefferson Medical College Hospital, Dr. Tyson made observations as to this condition in the babies born in that institution. During the first twenty-four hours after delivery, the infants that were extremely fretful, easily irritated, and cried on the slightest attempt to move them were suspected of having cerebral complications. Dr. Tyson also emphasized the importance of a temperature rise within the first twenty-four hours, the temperature ranging from 100° to 102° F., in the absence of any other signs or symptoms, as being quite characteristic of intracranial hemorrhage.

The obstetric forceps, if used injudiciously or applied improperly, are capable of causing marked damage to both baby and mother. The factor that calls for forceps application is not the duration of labor, but rather the character of the labor and the degree of resistance of the pelvic floor, which must be overcome by the presenting part.

DR. FOULKROD said that he did not apply forceps in the premature infant because of some studies made fifteen or twenty years ago which showed an increase in the death rate in such infants from intracranial hemorrhage. It is true that long labor in the same children might bring the same result but forceps should not be applied without first warning the parents that you are adding another risk to those already present.

DR. ULRICH said it was false to consider all cerebral hemorrhages as birth injuries. Toxemia is the most frequent cause of premature labor, whether such toxemia be recognized or unrecognized. We also know that toxemia is a blood-destroying disease. We have hemorrhage in the mother; it may be petechial in the skin and microscopic in the cerebral centers. Toxemia probably causes more cases of hemorrhage than does the time of birth or the manner in which the child is delivered. If this subject is to be presented as cerebral birth injury we ought to eliminate the abnormalities in connection with the case, i.e., the history of the mother regarding toxemia. Nearly all cases of premature birth are toxic and nearly all show blood changes. These blood changes are also manifested in the

babies prematurely born. For a long time we have known that babies born of toxic mothers will act in the same way as babies born after a long labor with great pressure. The symptoms in both cases are almost the same and the hemorrhage is the same. If we do not know whether or not the mother is toxic, we should not call the cerebral hemorrhage a birth injury. In the majority of cases toxemia is the cause.

DR. SCHUMANN said he confessed to a feeling of pessimism in the matter. The rather discouraging statistics presented some time ago before this Society by Dr. Wm. Sharpe of New York showed an incidence of 10 per cent of cerebral hemorrhage in 1000 consecutive labors of all kinds, breech, cesarean, forceps, etc. In every case the existence of cerebral hemorrhage was proved by lumbar puncture. On the one hand we learn that a long labor predisposes to cerebral hemorrhage. We learn that pressure from forceps predisposes. We hear that premature birth is an important etiologic factor. Prematurity is one of the obstetric problems which is beyond our ability to control. The toxic mother who delivers herself prematurely is beyond our skill to succor from such an accident. Dr. Schumann believed that cerebral hemorrhage will continue to be the most frequent cause of infant death in spite of any obstetric measures, unless perhaps the universal use of cesarean section. Difficult labor may be a predisposing factor, and yet we have all seen cases of rapid labor in the multipara, followed by devastating hemorrhage of the brain in the child.

DR. CAPPER (closing), said in reference to Dr. Stuckert's remarks about hemorrhagic diathesis and its etiologic rôle in cerebral hemorrhages, that Ehrenfest has emphasized the fact that we must put hemorrhagic diathesis as the last etiologic factor in cerebral birth trauma. Clinically, it means a predisposition to bleeding and it is recognized by certain clinical or laboratory methods, such as the occurrence of petechial hemorrhages in the skin, prolongation of bleeding or coagulation time, and the finding of a diminution in the blood platelets. Dr. Schumann referred to the work of Sharpe of New York who did lumbar punctures on 500 consecutive cases, and they had also done coagulation and bleeding time determinations in these cases and found no correspondence between the two diagnostic methods, i.e., cases where blood was found in the spinal fluid showed normal coagulation time and normal bleeding time. On the other hand, some of the cases in which the fluid was normal with no evidence of hemorrhage, the cases showed long bleeding time, etc. We must not forget that a coagulation time of ten to twelve minutes, while abnormal in adults, is normal in the infant and even fifteen minutes may be normal in the immature infant. Jaundice occurs more frequently in the premature infant and that contributes to the lengthening of the bleeding and coagulating time. Dr. Capper did not feel we should use the term hemorrhagic diathesis in discussing cerebral birth trauma because it does not play the part which we have previously supposed that it did.

DRS. CHARLES B. REYNOLDS AND LEONARD AVERETT presented a **Report of Samaritan Hospital Clinics.**

DR. C. M. STIMSON AND DR. HAROLD A. JONES (by invitation) read a paper on **The Erythrocyte-Sedimentation Test in Gynecology.** (See page 81 for original paper.)

DISCUSSION

DR. VIRGIL H. MOON (by invitation) said that there are one or two points which require emphasis if we wish to take the broader view of the reaction. One

is the variety of conditions in which the sedimentation test is applicable, in each of which the patient is absorbing tonic material from some source, eliminating it and being intoxicated by products of protein disintegration. Applying the test to each, we find: in pneumonia, a rapid sedimentation velocity; in typhoid fever, the same; also, in the more chronic conditions such as tuberculosis, syphilis, etc., conditions in which the patient is suffering from infections of low grade and absorbing more or less of protein material. Even in the non-infectious conditions such as extensive crushing injuries of the limbs, or in uninfected burns the body is absorbing material of injured protein and the sedimentation will be found to be rapid. The results reported by Dr. Stimson verify those found in a number of cases reported in Continental Europe. The test has only now begun to be applied in this country to the same extent to which it has been in European countries. The opinion of those who have tried it in many cases is that sedimentation velocity, temperature and white cell count run parallel, but where not parallel, the sedimentation velocity is more accurate than either of the other two, in giving information as to the condition of the patient.

Dr. Philip F. Williams presented a report on **Classification of the Toxemias of Pregnancy.** See page 38 for original article.)

Dr. George M. Boyd read a paper entitled **Puerperal Fever Before and After Lister.**

STATED MEETING, NOVEMBER 1, 1928

Dr. Bernard Mann described a **Large Cervical Fibroma Complicated by Severe Anemia and Bilateral Pyelitis.**

M. H. Case No. 47603, colored, aged thirty-five years. Admitted to the Mt. Sinai Hospital April 7, 1928, because of a marked anemia, vaginal bleeding and pain in the lower abdomen. Temperature 101° F. pulse 145, respiration 30. Five days before admission to the hospital she had a sudden profuse hemorrhage from the vagina. About ten months ago she had a similar hemorrhage which lasted about two weeks, when a curettage was done.

She had 3 children, last born four years ago, all spontaneous deliveries. She had one miscarriage nine years ago. Has been married ten years. Menstruation normal until two years ago, since then the flow has been profuse.

Patient was markedly emaciated, mucous membranes very pale, eyes rather prominent, with puffiness of the eyelids. Heart small, with rough and accentuated second aortic sound associated with a systolic murmur. There was no arrhythmia. The lungs were negative. A suprapubic mass the size of a three months' pregnancy was prominently outlined through the thin abdominal wall. The vagina was filled with a soft mass the size of a fetal head, the cervix could not be palpated. The vaginal bleeding at the time was moderate but the odor very offensive. Above this vaginal tumor an enlarged uterus could be felt about the size of a four months' pregnancy. The adnexa could not be outlined.

On admission: Hb. 13 per cent. R.B.C. 1,880,000. W.B.C. 28,600. Pmn. 81. S.M. 15. Tr. 1. L.M. 3. Sedimentation time: index 35 m. m. thirty minutes. Urine acid, 1025, trace of albumin, no sugar, many W.B.C., and R.B.C. Few granular casts. Blood Wassermann, Kolmer, and Kahn tests plus 4. Blood culture negative.

She was given 485 c.c. of blood by transfusion on April 9, 1928, 400 c.c. the next day and 575 c.c. on the third day. The blood count following the last trans-

fusion was: Hb. 42 per cent, R.B.C. 3,091,000, W.B.C. 17,700, Pmn. 86 per cent, S.M. 14 per cent. There was a marked rise in temperature with a chill following the second transfusion.

April 12, 1928, under nitrous-oxide and oxygen anesthesia, a cervical fibroma the size of a fetal head was removed. The pedicle was the thickness of 2 fingers and attached to the cervix and extended along its posterior surface into the uterine canal. Gauze packing was required to control the bleeding. The mucous membrane of the vagina was markedly injected from the pressure of the tumor, the cervix was enlarged about 4 times the normal size and funnel shaped.

There was a marked improvement in her general condition until the sixth day following the operation when she had a severe chill, rise in temperature to 105.4° and pulse 160 plus. On account of the foul discharge the uterine cavity was irrigated daily with tr. iodine and alcohol. The uterus was found to be much smaller than at the time of operation. She complained of pain in the right flank and tenderness was elicited in both flanks.

Cystoscopic examination showed the bladder mucous membrane slightly congested, the ureteral orifices were normal. There was no obstruction to a No. 6 catheter on its way to the pelvis of either kidney. The rate of flow from both kidneys was normal. Indigo carmine appeared in eight minutes from both sides. The urine from bladder and both kidneys contained pus and B. coli were demonstrated by culture. The pelves of both kidneys and bladder were irrigated with 5 per cent silvol and the catheters were allowed to remain for forty-eight hours.

The temperature of a septic type continued for eight days longer when it subsided to normal and continued normal until her discharge May 10, 1928.

May 4, 1928, she was again transfused with 530 c.c. of blood. Blood count: Hb 41 per cent, R.B.C. 2,910,000, W.B.C. 5,200, Pmn. 72, S.M. 28.

The pathologic report read, fibromyoma.

She was discharged from the hospital May 10, 1928. The uterus was normal size, the cervix was slightly hypertrophied. The adnexa were not palpably enlarged. There was very little leucorrheal discharge, no foul odor.

DR. ROBERT A. KIMBROUGH, JR., reported a case of **Coincident Carcinoma of the Ovary in Twins.**

The simultaneous occurrence of various infectious diseases in twins has been frequently reported and there is a striking similarity of the course of the disease in each twin, particularly in those cases in which there is evidence that the twins are of the uniovular type.

Surprisingly few reports of coincident neoplasms were encountered in the literature. Halliday-Croom reported the cases of two sisters who first menstruated on the same day. From thirty years of age until the menopause at fifty both suffered from menorrhagia. At fifty-three both were found to have adenocarcinoma of the fundus associated with myomas of the uterus. Burkard records the occurrence of similar fibroadenomas of the left breast in each of twin sisters at twenty-one years of age. The tumors were identical in histologic structure. Siemens cites the cases previously reported by v. Szontagh in which a papilloma of the larynx developed in twin sisters at the same time, giving rise to identical symptoms.

The twins whose cases are here reported are assumed to be identical or uniovular in type, since they are of the same sex and are almost indistinguishable in appearance, mental traits and mannerisms. As children they had measles, mumps and variola at the same time, and until twelve years of age they never varied more than one-half pound in weight. Menstruation began in A one month before it appeared in B. In both, menstruation was accompanied by violent cramps, diarrhea and

vomiting on the first day of the flow. In both, menstruation occurred at intervals of three or four months until the age of twenty-eight, after which a twenty-eight day cycle became established in both.

A was married at the age of twenty-seven and two years later was delivered of a normal child. B was married at the age of twenty-nine but never became pregnant. A developed bronchial asthma following tonsillectomy in 1923 but except for this, both were well until thirty-nine years of age.

In September, 1925 both began to complain of dull pain in the left lower abdomen. A's pain was more severe than that of B, so that A was the first to apply for treatment. She was operated upon by Dr. Floyd E. Keene at the University Hospital on December 1, 1925, and was found to have bilateral ovarian carcinomas and a submucous myoma of the uterus. Hysterectomy and bilateral salpingo-oophorectomy were performed. The left ovary was densely adherent to the pelvic wall near the iliac vessels, so that complete excision of the growth was impossible. There was, however, no evidence of glandular metastasis. She made an uneventful convalescence and deep roentgen-ray therapy was instituted on the fourteenth postoperative day.

B continued to have increasingly severe pain in the left lower quadrant, but did not report for treatment for two years after its onset. She was operated upon by Dr. Keene on September 16, 1927. She, too, was found to have bilateral ovarian carcinomas associated with uterine myoma, but there was no evidence of either peritoneal or glandular metastasis. Hysterectomy and bilateral salpingo-oophorectomy were performed. Convalescence was entirely normal and roentgen-ray treatment was started ten days after the operation.

As stated above the growth was bilateral in both cases and in each the ovaries were practically equal in size varying from 7 to 9 cm. in diameter. In A the tumors were cystic and on section, flat friable papillae were found on the inner aspect of the neoplasm. Microscopic examination revealed the typical structure of a papillary adenocarcinoma.

The masses removed from B were more solid and no papillae were demonstrable. Histologically the growth was found to be an adenocarcinoma glandulare.

Both patients have received intensive radiation therapy. B is free from symptoms and there is no evidence of recurrence thirteen months after operation. On pelvic examination of A there is no suspicion of local recurrence, but certain vague symptoms in the right upper abdomen suggest the possibility of more distant metastases.

DISCUSSION

DR. LEWIS C. SCHEFFEY said that several years ago at the Jefferson Hospital, a sarcoma was found in a twin of sixteen years of age who had never menstruated. The other twin had never menstruated either, but her examination did not reveal any evidence of a growth. A similar condition in the sister was looked for because of the parallel history.

DRS. DANIEL LONGAKER AND WALTER F. HARRIMAN reported **A Case of Fibroleiomyosarcoma Complicating Pregnancy, Labor and Puerperium.**

The patient was first seen in October of 1925. She was a large, obese woman, thirty-six years of age, complaining of leucorrhea and frequent miscarriages.

In 1911 she was delivered of a seven pound normal, male child, and the following year (1912) a second pregnancy was terminated by an early miscarriage. Her third pregnancy (1920), terminated in a miscarriage at five months, and the fourth (1924), both of these pregnancies twins, ended in premature labor at eight months.

Except for chronic leucorrhea her general health was good. Physical examination revealed an eroded and infected cervix and a small retrouterine tumor which was presumed to be an ovarian cyst. Believing the endocervicitis the primary factor causing her frequent miscarriages, the cervix was treated by the electrocoagulation method.

She returned pregnant, in October, 1927. During the early months of pregnancy there was little, if any, gastrointestinal disturbance. The blood pressure and urine remained normal throughout the prenatal period. On examining the patient during the ninth month of pregnancy, two distinct masses were found in the abdomen and, taking into consideration her past history, it was suspected that this might be her third consecutive twin pregnancy.

Labor came on somewhat before the estimated date and after eight hours of strong, regular uterine contraction the head was still at the brim. Examination revealed a fully dilated cervix and she was delivered of a seven and one-half pound baby by podalic version. Following delivery the uterus was found to be fully contracted and displaced somewhat to the right by a spherical, movable mass about the size of a large grapefruit and of firm consistency. A diagnosis of ovarian cystoma, confirmed by Dr. B. C. Hirst, was made and operation urged.

At operation, five days postpartum, a large spherical mass attached to the left posterior surface of the uterus, adherent to the left fallopian tube and ovary and intimately attached to the descending colon, was removed. The cleavage line between the descending colon and tumor was readily found. The fallopian tube, ovary, tumor, and a portion of the uterus were removed en masse.

The tumor measured 12 cm. in diameter, was cystic and contained a brownish, serosanguinous fluid. The serosal surface showed numerous vessels and small, firm, nodular elevations. The wall was approximately 1 cm. in thickness and lined on the inner side by a fatty pedunculated material.

Microscopic sections were definitely diagnosed fibroleiomyosarcoma. Early recurrence was predicted by Dr. Reimann, whose report on the histology of the growth follows:

"Specimen consists of spherical tumor mass measuring 9 cm. in diameter and weighs 300 gm. It is cystic in character, has been opened and contents lost. The serosal surface shows numerous vessels and small firm nodular elevations. The wall is approximately 1 cm. thick and is lined inside by fatty pedunculated material. No evidence of hair or bone can be seen. On one side of tumor is a small amount of normal ovarian tissue. A normal uterine tube is also attached by ovarian ligament."

The points of interest in this case were the finding of a small, retrouterine tumor on examining the patient in 1925; mistaking the two masses in the abdomen for what was believed to be a third twin pregnancy; a rapid growth of the tumor which was undoubtedly influenced by pregnancy; removal of the tumor on discovery in 1925 would have assured a permanent cure.

DR. BARTON COOKE HIRST read a paper entitled **Malignant Growths of the Uterus in Young Girls.** (For original article, see page 104.)

DISCUSSION

DR. F. E. KEENE said that he saw in Wertheim's Clinic in Vienna some years ago, a patient with carcinoma of the cervix who was eighteen years of age. During the past few years he had seen several patients under thirty. Even rarer he found carcinoma of the fundus at an early age. Dr. Norris and Dr. Vogt have recently reviewed the cases of fundal cancer in the Service at the University Hospital and found that in 17 per cent the lesions are found as a premenopausal manifestation.

Characteristically of course this lesion usually occurs later in life. There were two patients in whom fundal cancer was present who were under thirty years of age and one of these, twenty-four years of age, was operated upon recently. Five years ago she was seen by Dr. John G. Clark and at that time the curettings showed a marked hyperplasia of the endometrium with no evidence of malignancy. Last August she again returned to the clinic on account of irregular menstruation and at this time the curettings showed an adenocarcinoma, for which a panhysterectomy was performed.

Of the cases of carcinoma of the cervix which have developed in young women, in two it complicated pregnancy, one was twenty-six years of age and the other twenty-four. Dr. Keene saw one of these patients twelve years ago, at which time she was about six months pregnant. The patient was almost exsanguinated and presented a large cauliflower carcinoma of the cervix. The malignant growth was excised with a cautery, and she received 3,000 mg. hr. of radium element and was instructed to return to the clinic in a month. She did not return until two months, at which time the cervix was dilated. She was delivered of what was apparently a normal child and was again treated with radium. Dr. Keene recently saw this patient, that is, twelve years after her first irradiation, and she is apparently cured. The child is a microcephalic idiot.

DR. HIRST said he would like to know the experience of other members as to the coincidence of syphilis with the occurrence of cancer in the young.

DR. CATHARINE MACFARLANE said that one of the youngest patients with cancer of the cervix she had seen was a twenty-seven-year-old negro woman in the Woman's College Hospital. She had borne one child and her blood showed a four-plus Wassermann reaction. In a recent review of 63 cases of cervical cancer Dr. Macfarlane found a positive Wassermann reaction recorded in six cases or 9½ per cent. Six of 63 cases were under thirty years of age and of these, one had a positive Wassermann as mentioned above.

DR. CLIFFORD B. LULL had seen one case of carcinoma of the cervix in a woman of about twenty-six years of age, during pregnancy. She was sent to the hospital with a history of having a full-term pregnancy and having been in labor fifteen hours ineffectually. It was diagnosed as placenta previa but she actually had a growth of the cervix involving not only the cervix but the entire vaginal vault. A cesarean section was done, the child lived and the mother died.

DR. J. S. RAUDENBUSH recalled one patient, twenty-six years of age, in whom was found a bleeding surface and a cauliflower excrescence of the cervix.

DR. CHARLES MAZER AND DR. JACOB HOFFMAN presented a paper entitled, **On the Occurrence of Ovarian and Anterior Pituitary Hormones in the Urine of Pregnant Women.** (For original article, see page 48.)

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF DECEMBER 7, 1928

DR. WILLIAM C. MEAGHER reported a case of **Rupture of Uterus During Labor After Amputation of the Cervix.**

It is clearly shown by the following case report that predisposition to a severe rupture of the uterus in labor is occasioned by an amputation of the cervix and, that such a rupture, accompanied by severe internal hemorrhage, may present itself without the characteristic picture of profound shock and the customary blood findings.

C. S., forty-two years old, married sixteen years, was admitted to St. Catherine's Hospital October 22, 1928, at 9:00 A.M. complaining of a constant pain over the entire abdomen. Four days before admission labor began and persisted with pains at hourly intervals until the membranes ruptured on October 20, thirty-six hours before she entered the hospital. At 1:00 A.M., eight hours before admission, there was full dilatation and the caput was just visible. Pains were then at two minute intervals and very strong, but one-half hour later, the regular rythmic contractions of the uterus ceased, and were replaced by a continuous pain in the upper abdomen. Two doses of 1/80 grain of strychnine sulphate was given but without result, and a forceps delivery was easily accomplished under ether anesthesia at 3:30 A.M. The fetus was stillborn, no fetal heart having been heard for two days prior to delivery, and the position was L.O.A. Following the birth of the baby, no bleeding was evident and the attempted Credé was without result. The uterus was firm, and in trying to express the placenta the cord was noted to retract and no further manipulation was attempted. The patient's pulse increased to 120 a minute, and she continued to complain of a moderately severe pain in the upper abdomen but her general condition was good. Her previous obstetric history included 7 full-term deliveries, the first after a three day labor, the next four after labors of two to three hours each. The sixth occurring fourteen months after an operation on the cervix, lasted thirty-one hours. This operation performed at Bellevue Hospital is described by the historian as an amputation of the cervix, perineorrhaphy, appendectomy, and Baldy-Webster suspension of the uterus. Follow up two months later showed the operative result to be excellent.

In 1922 the patient was operated upon at Wykoff Heights Hospital for strangulated hernia, from which she made an uneventful recovery. In 1924, four years after the operation in Bellevue, she had an induced abortion at three months at her home.

Her menstrual history was negative, except for amenorrhea over a period of sixteen months before present delivery.

On admission the patient, a white female, forty-two years of age and considerably overweight, was in good condition, there being no evidence of shock. Color of the lips and skin, and the body temperature were about normal. The abdomen was obese and relaxed, and presented numerous striae. There was a slight distention of the upper abdomen with a generalized tenderness and rebound tenderness, but no rigidity. A hard mass taken to be uterus, was noted above the symphysis extending to the umbilicus on the left side. About 10 inches of cord protruded from the vagina and there was no vaginal bleeding. Gentle pressure on the fundus uteri did not alter the position of the cord. The blood pressure was

138/96. The blood count showed 4,300,000 red cells, 75 per cent hemoglobin, 7,600 leucocytes, 76 per cent polys, and 24 per cent small lymphocytes. The urine was negative except for a slight trace of albumin. Vaginal examination immediately before operation revealed a laceration of the uterus that extended from the rim of the cervix upward toward the broad ligament. The umbilical cord led up through this rupture. The operation performed was a subtotal hysterectomy and a right salpingo-oophorectomy. The abdomen was full of blood and clots, and there was a laceration of the uterus about 8 inches in length as already described, but also extending through the posterior layer of the broad ligament. The placenta was in the right upper portion of the abdomen. The procedure consisted of the removal of the placenta and the uterus, with the right tube and ovary, leaving a small portion of the cervix. The large vessels were tied off and peritonealization accomplished. Wound closure was in layers and one Penrose drain was inserted. The time of operation was thirty minutes, the pulse rate varied from 120 to 136, the respirations were 40-48 and the anesthetic used was ether.

The postoperative course was practically uneventful. Drainage of serosanguinous fluid was profuse for three days, after which the drain was removed. The highest postoperative temperature was 100.3 and the highest pulse rate was 116. The blood pressure, six hours after operation, was 146/98. Distention of the upper abdomen was relieved on the third day by gastric lavage. No difficulty was experienced with urination and the bowel function was easily established. On the eighth day postoperative, an area of periphlebitis was noted about an old varicosity 4 inches above the left knee. Four days later this had sufficiently improved to permit the patient to get out of bed. On the nineteenth day union in the wound was primary and on vaginal examination the cervix was found to be short, the vaginal portio measuring about one cm. in length with no demonstrable canal or definite os. This was freely movable without pain. No masses were felt and the patient was discharged.

Follow-up examination December 5, showed the patient was in excellent physical condition. Her wound was firmly healed and the small portion of the cervix could be easily moved without pain. There was no discharge. The varicosity above the right knee was causing no discomfort.

Drs. H. J. Stander, and E. P. H. Harrison, Jr., of Baltimore, read, by invitation, a paper on **Carbohydrate Metabolism in Eclampsia.** (For original article see page 17.)

DISCUSSION

DR. C. A. GORDON said that there ought not to be much difference of opinion as to hypoglycemia and hyperglycemia after listening to Dr. Stander's paper. Nevertheless, many present have been impressed by the careful work of Titus, Dodd, and Willett. Their conclusions possibly result from different methods of estimation of blood sugar, because, apparently, their normal is not anywhere near the normal stated by Stander, which is somewhere around 60. If that is the criterion by which we are to be guided, some of us possibly would be open to censure if we did not use insulin in some types of cases, as Dr. Stander insisted.

Whether there is or is not a hypoglycemia or hyperglycemia in the blood stream at the time that the insulin is injected would seem to be a very important consideration.

Dr. Gordon had abandoned venesection absolutely for a long time, even before Dr. Stander claimed that it was of no value. He had used transfusions of blood as high as 1,000 c.c., but more commonly of 650 to 800 c.c. with no success, and now had given up almost all active treatment in eclampsia, including glucose and insulin.

DR. CAMERON DUNCAN stated that in the Kings County Hospital most of the blood chemistry tests were normal, no hypo- or hyperglycemia being noted. The CO_2 combining power did not vary much from normal. As a matter of routine, however, glucose was tried and results were decidedly better with glucose and conservative methods with a modified Stroganoff treatment than on any previous service by any other method. He did not do phlebotomy.

In regard to the point as to whether a normal glucose reading may mean a relative hypoglycemia and the addition of a certain amount of glucose may combat this relative hypoglycemia, Dr. Duncan was in doubt as to what the term "relative" really implies. Titus talks about relative hypoglycemias where they are away up to 130 or 140 and where they drop 10 or 20 points, and insists that those cases need glucose right away.

DR. S. A. WOLFE said that from the standpoint of the pathologist the cause of death in eclampsia has always been unexplainable, except in those rare instances where extensive intracerebral hemorrhage has occurred. The necrosis in the liver limited to the periphery, the hypertrophy of the lobules, and the thrombosis of the hepatic vessels, are insignificant for an organ the size of the liver. The nephrosis in the kidneys certainly is not causative of death. Dr. Wolfe was interested to learn that eclampsia is not a disease primarily involving the vital viscera, but actually a metabolic derangement causing fatal acidosis.

DR. HARRY KOSTER said he expected to hear a paper on carbohydrate metabolism and was a little disappointed to find the essayist speaking about the glucose values of the blood. He is to be commended for having stuck to that line because instead of indulging in idle speculation he pointed out some of the difficulties that we all encounter in studying carbohydrate metabolism, particularly our inability during life to determine accurately the glycogen content of the liver or of the muscle. However, he did not touch upon, except when he mentioned the respiratory activity, the inability to determine by ordinary methods how much glucose is used in the body at any particular time. That, it seems, is the only point worth discussing in the use of insulin and glucose for this or any other condition in surgery or medicine. Dr. Koster felt that no one can take issue with the doctor upon his findings. The series of cases studied is sufficiently large; his methods certainly were the most accurate available at the time he was working, and the only thing we can do is to accept them as a very fine contribution to blood chemistry glucose studies in the toxemias of eclampsia. However, he would like to point out that, according to the charts, there seem to be a few inconsistencies. In the first place he calls attention to the fact that in the toxemias of eclampsia there is always an increase in the sugar content. Bearing that in mind, whether it is after a convulsion, before a convulsion, or during a convulsion, it is hard to understand how glucose therapy at that particular time is going to do any good, until we find out whether the increased glucose content of the blood (hyperglycemia) is due either to a failure to pass it through the kidneys because of a high threshold value, or due to excessive liver and muscle glycogenolysis, which is depleting the liver and muscles of their glycogen and increasing the store in the blood. Or whether it is due to excessive splanchnic stimulation during that period of depletion, or due to adrenalin failure in the adrenals. It is idle to use glucose as a method of therapy as long as we have an increased blood sugar. There should be little danger in the use of small doses of insulin in these cases as long as there is a definite hyperglycemia. Issue might be taken on the point of the normal low values, although chemists now are very much agreed that the old high values of 100, 115, 120, or 125 were entirely too high.

The important thing about this whole problem and which should be very definitely emphasized, is that we have about reached our limits of exploration in the field of carbohydrate metabolism by the methods that we have hitherto used clinically and in our hospital laboratories at the present time. Until we become acquainted with the use of the Tissot colorimeter, which will give us not only the oxygen consumption, but also the CO_2 production, from which we can derive the respiratory quotient and determine whether the glucose is being poured out through the kidney or is being stored in the body, or utilized, as shown by the respiratory quotient, it is foolish to continue with glucose and insulin therapy under our present conditions. The ordinary Sanborn apparatus is valueless because it simply gives the oxygen consumption reading.

There is one other point in the administration of insulin as compared with the utilization of alkalies for combating acidosis, that should be noted. The utilization of insulin for combating acidosis is of value in only one type of case, where there is definite evidence of failure of the utilization of the carbohydrates, or failure to supply carbohydrates to the body, and in those cases there is always an acidemia because of the utilization of fat stored in the body and the production of ketogenesis or ketone products. That is a different acidemia from the acidemia of nephritis, where the phosphorus ion of the blood is increased because of the retention of the phosphorus acid ion, and in the latter type of case insulin therapy would be of no value at all. To combat that type of acidosis, it must be recognized and treated by the administration of alkalies.

Recently Palmer and Van Slyke found that they could increase the carbon dioxide in the blood one volume per cent by the addition of half a gram of sodium bicarbonate for every 42 pounds of body weight.

DR. STANDER, in answer to Dr. Gordon whether it is safe to give insulin in eclampsia, said that in the cases treated with insulin, he had invariably raised the CO_2 combining power, and had no untoward results; and, furthermore, that in some of these cases he gave twice the dose recommended and, although the blood sugar was brought down to almost convulsive hypoglycemic levels there were no untoward results. Dr. Stander felt that it is safe to give insulin, up to 20 units, in a case of eclampsia where there is a very low CO_2 combining power, or, if you do not have the opportunity of learning what the CO_2 combining power is, in a case that stays in a deep coma after a convulsion.

Dr. Duncan stated that most of their cases showed normal blood sugar. In the majority of Dr. Stander's cases there was a tendency toward a hyperglycemia and in very few did he note values below normal. In most cases of eclampsia one will find values above the normal, in some values at normal, and in very few values below normal. The majority show a slight tendency upward, above the normal blood-sugar level. He also referred to the term "relative hypoglycemia," as introduced and used by Titus. If he (Stander) understands Titus correctly, by this term he means that the blood sugar would be at a certain level and then, suddenly, in a few minutes (five or so) drop 20, 30, or 40 mg. below that point. Whether the blood sugar happens to be up around 200 or 100 mg. there is a relative drop, and this drop preeedes the convulsion.

In regard to Dr. Koster's remarks, his criticisms may perhaps be well taken, but he might be answered in this way: generally, we have low CO_2 values, we give insulin, take a blood specimen half hour after giving the insulin, and find that the CO_2 combining power is anywhere from 5 to 15 volumes per cent higher. To give a very typical case, we will have an eclamptic with a CO_2 combining power of approximately 25 volumes per cent. The patient is desperately sick and in

coma. She is on a modified Stroganoff treatment, but we feel that while the CO_2 combining power is about 30, or, say, around 35, she is fairly well off and is not developing marked acidosis; but if she has a CO_2 combining power of 25 or lower, say, 20, we feel that we should do something for her acidosis. Some may not feel that way about it, but Stander was convinced that the acidosis should be treated; and from the cases thus treated (approximately 40 in number), he found, generally, that 15 to 20 units of insulin will raise the CO_2 combining power 5, 10, or 15 volumes per cent. He had great faith in insulin in that type of case and while he had not used alkalies it may do the same thing.

Khreninger-Guggenberger, J.: Investigation of the Blood Groups of Retroplacental and Umbilical Cord Blood, Monatschr. f. Geburtsh. u. Gynäk. 80: 104, 1928.

The author attempted to discover whether maternal and fetal blood mix in the third stage of labor when the placenta is separated from the uterine wall. In a series of 200 blood grouping determinations of the retroplacental blood, no conclusions could be reached. Neither the test tube method nor the cover slip procedure yielded any definite results. The bloods could not be classified according to the four standard groups and the impression obtained was that the fetal and maternal bloods had mixed. To determine the intactness of the placentas, 50 fresh placentas were injected with air while they were under water and in every case except one air bubbles escaped.

In addition to the above cases, the author studied 12 cases in which the blood corpuscle reactions did not show the expected serum reactions. The author concludes from his studies that as yet we do not possess methods of determining the paternity of a child by an examination of the blood groups immediately after birth. Furthermore, comparative examinations of the umbilical cord and retroplacental bloods cannot form the basis of subsequent blood grouping determinations.

J. P. GREENHILL.

Vogt, E.: Prophylactic Thrombosis of Varices, Monatschr. f. Geburtsh. u. Gynäk. 80: 422, 1928.

Linser was the first to produce artificial thrombosis of varicose veins for therapeutic purposes and for the cure of chronic leg ulcers. He originally used ½ to 1 per cent bichloride of mercury but recently the less dangerous 10 to 15 per cent sodium chloride solution has been employed. Vogt attempted to employ this procedure during pregnancy, but he could not produce complete thrombosis of the saphenous vein. He did succeed however in producing thrombosis of varicose veins in the vulva. In his experience with 20 patients he encountered no serious consequences.

J. P. GREENHILL.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

OVARIAN NEWGROWTHS

Keller, T.: The Normal and Pathologic Activity of the Germinative Epithelium of the Adult Ovary, Gynéc. et Obst. **17:** 10, 1928.

The characteristic cytology of the germinative epithelium of a series ascending in the scale of biologic complexity is given in detail. It is shown that the germinative epithelium in the lower vertebrates has the property of regenerating oocytes. This property is noted also among certain of the mammalia. In others of the mammalia, this activity appears altered and utilized in the formation of a tissue, the rôle of which is unclear. In still other groups, in the normal state, the germinative epithelium has completely disappeared. This is true in the Primates. However, under the influence of the slightest irritation it reappears, its activity causing the formation of papilliary cysts whose pathologic importance is considerable. The observations of others to this effect are substantiated by the author's studies in vitro and in vivo. In woman, the activation of the germinative epithelium appears to occur only on a pathologic basis. Ovarian tissue demonstrating this action has been described repeatedly. After summarizing the findings of many others, the author cites 10 personal observations. It is pointed out that this response, abnormal in humans, is but an example of the typical normal reaction of the lower mammalia and invertebrates. No doubt the interstitial tissue of the human ovary is simply a transitional phase between the germinative epithelium and the oocyte.

Doubtless the tiny cysts originating from an initial reaction of the germinative epithelium in the human may be responsible for the formation of racimose or mucoid cysts of the ovary or of papillary tumors. The character and frequency of these tiny cysts, definitely ascribable to primary alterations of the germinative epithelium, point to them as the etiologic factor in the origin of larger cysts. The author thinks that they also play a part in the origin of dermoids and teratomas. Since they are able to achieve the oocyte stage, is it not logical to suppose them potential for the formation of growths similar to those ascribed to the usual ovarian cellular constituents? Furthermore, in the presence of this potentiality of the germinative epithelium, it seems unnecessary longer to fall back upon the poorly grounded hypothesis of "embryonic rests."

GOODRICH C. SCHAUFFLER.

Hartman, H.: Formation and Ripening of Graafian Follicles In the Newborn and in Children, Arch. f. Gynäk. **128:** 1, 1926.

Hartman sectioned 58 ovaries obtained from female children ranging in age from the seventh month of fetal life to twelve years of age, and found graafian follicle development in the majority of them. In more than one-third

of these ovaries, macroscopic cysts were demonstrated, some being numerous enough to involve over one-half the ovary. The ovary of one case, from a girl five months of age, was of special interest, the cysts being so numerous that only a few strands of ovarian tissue remained between the many cysts. Another specimen from a newborn baby, contained only three cysts but these were of sufficient size to involve at least one-fourth of the ovarian structure.

These ovaries showed no evidences of pathologic changes externally and especially no evidences of inflammation, either grossly or microscopically. The epithelial formation in these cysts left no question as to their origin from graafian follicles. These cystic formations so closely resemble the polycystic degeneration of the ovaries which are so frequently seen in the adult that the author suggests the possibility of such cyst formation in children being the forerunner of polycystic degeneration of the ovary as seen in later years.

RALPH A. REIS.

Fellner: Genesis Of Ovarian Hematomata, Arch. f. Gynäk. 129: 400, 1926.

Fellner does not agree with the Sampson theory of transplantation of bits of uterine mucosa by means of the fallopian tubes. In 3000 specimens of ovaries from laboratory animals which do not menstruate (rabbits, guinea pigs and mice) typical uterine glands were found only once. He produced an artificial menstruation (hyperemia of the follicles, etc.) by injecting large amounts of lipoids. Following this the glands and more especially the follicles became blood cysts with hemorrhage in the lumina of the glands originating in the ovarian epithelium. The bleeding is, therefore, not uterine in origin.

Fellner next studied hematomas in the swine in which the menses resemble that of the human. Sixty-one of the 74 hematomas studied showed layers of degenerated lutein cells in their walls. Most of the remainder were follicular in origin. None were found that might have originated in the uterine glands. All gradations of epithelium were found in these hematomata ranging from the most immature to fully developed and mature cells. The author believes this to be due to hormone action. This explanation would simplify the theory of the formation of these hematomata in the human where the lipoid action is most pronounced. He thus confirms the Robert Meyer theory of the transformation of ovarian epithelium to uterine glandlike structures by means of hormone stimulation.

RALPH A. REIS.

Stevens, T. G.: Hemorrhagic Ovarian Cysts a Common Cause of Pelvic Pain, Clin. J. 55: 25, 1926.

Clinically hemorrhagic ovarian cysts occur as a rule between the ages of twenty-five and forty-five. They do not appear very often in single women but most frequently in married women who have not borne children, and in some fashion or other they seemed to be connected with sterility. Symptomatically the patient complains of increasing dysmenorrhea which is unusual of course in women after twenty-five years old. The pain begins two or three days before the flow and lasts during the first two or three days. Pain in the rectum and bearing down sensations are usually complained of and this is due to the fact that the rectum is often adherent to these tumors and to the posterior portion of the uterus. Dysmenorrhea is present during menstruation because the tumors are under increased tension at the time. Usually swellings are palpated on both sides of the uterus quite indistinguishable from the swelling found without suppuration, in connection with other tubal pathology. The diagnosis is

usually easy if the patient has never had an attack of anything like a pelvic peritonitis and if the dysmenorrhea symptom is kept in mind.

When opened the cysts discharge a chocolate to tarry like fluid. The cysts are always lined with an endometrial epithelium. Sampson's theory is probably correct as regards the origin of these cysts. The histology and pathology of the cysts and of pelvic adenomyomas are strikingly similar.

At operation these cysts are difficult to remove because of their dense adhesions and the problem of whether they are to be removed or a hysterectomy performed is a matter for the judgment of the surgeon. He must always bear in mind the question as to whether they might give rise to malignant growths in the pelvis.

A. C. WILLIAMSON.

Rohdenburg, G. L.: An Analysis of 500 Tumors of the Ovary, J. Lab. & Clin. Med. **12**: 211, 1926.

Rohdenburg made a study of 500 ovarian tumors. The only classification possible is not genetic but as follows: Solid tumors with areas of cystic degeneration or cystic tumors with solid areas. He furthur subdivides these into benign or malignant also with reference to their histologic origin as epithelial, follicular, germinal, connective tissue, or endothelial. Of these tumors 75.9 per cent were primarily cystic, 14.2 per cent cystadenomas and 12.2 per cent dermoid cysts and teratomas.

Retention cysts were common and of varying sizes. Their fluid contents varied from clear to chocolate brown in color. The cyst walls were composed either of compressed ovarian tissue or connective tissue. Corpus luteum cysts were common. Cystadenomas filled with mucous, stringy fluid were the most common of ovarian tumors, being found in 71 cases or 14.2 per cent of the series. These tumors have varying-sized multiocular cysts. Usually cystadenomas are benign, only occasionally malignant.

There were 61 dermoids of which 18 were pure dermoid cysts with skin and appendages. In 22 of these, three fetal layers were observed. In the teratomas, brain tissue was observed 34 times. In one case a complete choroid plexus was found. Retinal pigment was found in six cases, thyroid tissue in nine, and cartilage, bone or teeth in all.

Malignant degeneration occurred in six cases or 10 per cent; 4 of these were carcinomas of epithelial origin.

Solid tumors were very rare occurring in 0.8 per cent of the cases; most of these were adenofibromas. There were 16 cases or 3.2 per cent papillomas of which there were two types, those with secreting and with nonsecreting epithelium. Fibromas occurred in 23 cases or 4.6 per cent; in some the blood supply was abundant, in others the blood vessels showed a marked sclerosis. There are two possible sources of origin, one from the tunica adventitia of the blood vessels, the other from the stroma ovarii thus suggesting a congenital origin of the latter.

Degenerative changes such as hyaline or mucoid degeneration, necrosis, and hemorrhage with liquefaction were common. There was one case of sarcomatous degeneration. Ovarian sarcoma was found in 15 cases or 3 per cent. Carcinoma was present in 64 cases, primary, or secondary to a previous benign tumor, such as cystadenoma. There were three Krukenberg tumors, two metastatic, one from the stomach and one from the large intestine. The third Krukenberg tumor was bilateral and primary in the ovaries. There was one case of folliculoma ovarii.

W. B. SERBIN.

Manheims, P. J.: Folliculoma Ovarii, Arch. Path. & Lab. Med. **1:** 557, 1926.

Manheims reports a case of a woman aged fifty-two, where the only symptoms were irregularity of menstruation and slight loss in weight. At operation the right tube and ovary and left tube were removed. In addition an oval solid tumor 18 by 12 cm. was removed from the culdesac of Douglas. Histologic examination revealed a number of rosetlike alveoli in a stroma closely resembling ovarian stroma. The epithelial cells were columnar with nuclei at the periphery. The cytoplasm of these cells contained fat droplets or globoid bodies which had an affinity for Sudan III. In some areas there were polyhedral cells with clear cytoplasm. These cells did not contain fat. The cellular structure of this tumor is believed to take its origin from the primordial ova of the graafian follicle and seems to agree in most details with the tumor originally described by Gottschalk and designated by him "folliculoma malignum ovarii."

W. B. SEBBIN.

Babes, A., and Rapile, D.: Perithelioma of the Ovary, Gynéc. et Obst. **14:** 319, 1926.

Most authors deny the existence of the so-called perithelioma and consider the cases described as either sarcomas or carcinomas. From the study of his own case and 15 cases gathered from the literature, the author has determined that the perithelioma is derived from endothelial elements at the periphery of the small vessels and that the tumor resembles an endothelioma, except in certain minor microscopic characteristics. It has been most easily confused with perivascular sarcoma from which it differs in the beltlike arrangement of the neoplastic elements about the vessels and in the existence of chords in which there appears a similar beltlike arrangement about a vascular canal, but not a definitely formed vessel. The cellular type is characteristic, containing a large nucleus with no notable intercellular substance and resembling typical endothelium more than anything else. This cell type differentiates it from sarcoma.

Excluding the cases which might tend to obscure the deliniation of a definite type, the characters of this tumor are drawn from only 7 of the 16 cases. Microscopically, the outstanding features are the type cell as described, its beltlike arrangement about the small vessels, its occurrence in chords, surrounding other atypical vessellike cavities which appear to anastamose and contain blood, and the hyalin degeneration of the adventitia of the small vessels involved. These are the important differential features. Microscopically the growths vary in size from the head of a baby to that of an adult, are multilocular but more solid in nature than the common ovarian cyst. The cystic content is blood or serosanguinous fluid. The author believes that these tumors arise independently and do not originate in ovarian cysts. The prognosis is variable, as there is a wide variation in the degree of malignancy. Metastasis may occur.

GOODRICH C. SCHAUFFLER.

L'Esperance, E.: Embryonal Carcinoma of the Ovary, Arch. Path. **5:** 402, 1928.

The author presents a series of six cases of solid carcinoma of the ovary of the embryonal or teratoid type. The age incidence varied from fifteen to forty-six years, 4 having occurred before the twentieth year. Three of these patients were unmarried and three married but never pregnant. In the entire series, these tumors were associated with disturbances in ovarian function as shown by the late onset or complete absence of menstruation, irregularity, sterility, and imperfect development of the secondary sex characteristics.

Evidence of congenital origin of these tumors is shown by the fact that there may be absence of uterus and tubes and arrested development of the ovaries. Likewise the development at or near puberty implies an interrelation between functional activity and rapid growth, and the same stimulus which produces the onset of menstruation may produce growth of these tumors. They are analogous to tumors of a similar nature which occur in the testes of the male. They may be unilateral or bilateral, usually are encapsulated and show little tendency to cyst formation. Microscopically, the cellular structure may vary from small round cells with little cytoplasm to larger ones with acidophil cytoplasm. The arrangement is diffuse with some tendency to produce epithelial rests. Lymphoid stroma was present in all cases in this series, a characteristic feature in embryonal carcinoma of the sex glands.

These neoplasms probably arise from sex cells; in the ovary the condition is slightly more complex than in the testis. The histogenesis of these tumors is still uncertain; some are endotheliomas, some carcinomas, some sarcomas. As regards treatment, combined surgery and radiation seem to give the best results. Radium is not altogether successful.

W. B. SERBIN.

Rosenstein, W.: Bilaterality in Ovarian Tumors, Monatschr. f. Geburtsh. u. Gynäk. **78:** 302, 1928.

Whenever an ovariotomy is performed a question arises concerning dealing with the other ovary. The author reports three cases where the disposition of the remaining ovary was incorrectly decided upon. Whether or not the remaining ovary is to be removed will in a large measure depend upon the age of the patient. Furthermore an ovarian tumor must be classified during the operation, hence it should be opened as soon as it is removed, and not at the end of the operation. All ovarian tumors have a tendency to be bilateral. The author sums up his study by agreeing with Pfannenstiel who said that the opposite ovary should be removed in all cases of papillary tumors, carcinoma, endotheliomas, and soft sarcomas regardless of the age of the patient. Conservatism may be practiced for the purpose of conception but not to prevent menopausal symptoms in cases of hard sarcomas and teratomas because these do not have much tendency to be bilateral. In young women, the opposite ovary should be left in all cases of teratomas and benign neoplasms, especially the pseudomucinous cysts and the nonpapillary serous cyst adenomas. The remaining ovary may also safely be left in cases of dermoid, fibromas, simple serous cysts and all cysts due to nutritional disturbances.

J. P. GREENHILL.

Colombet: Concerning a Type of Intraligamentary Dermoid, Progrès méd. No. 5, p. 172, 1927.

A patient, thirty years old, married and sterile, complained of dull pain in the lower abdomen. Examination revealed a large mass. Operation showed it to be a large cystic tumor (with sebaceous fluid) subperitoneal, retrovesical, preuterine and extending laterally almost symmetrically into the two broad ligaments. The author believes the cyst to have originated from a dermal inclusion in the region of the inferior part of the canals of Gärtner rather than from the wolffian bodies or paraovarium. No other such case has ever been reported.

GOODRICH C. SCHAUFFLER.

Kraul, L.: The Myoma Ovary, Arch. f. Gynäk. **129:** 526, 1927.

The presence of uterine myomas has a definite effect upon the ovaries. The author made histologic studies of a series of ovaries removed together with myomas and found that the presence of the latter increased the structural and functional activities of such ovaries. These changes, he feels, are due to the pelvic hyperemia produced by the uterine tumors and he compares such changes to those produced by pregnancy. Such ovaries are larger than normal and are always congested. The corpora lutea are always larger than normal, the theca interna hypertrophied and the degenerative changes always less than normal. The location of the myoma also plays a rôle. Those which are submucous or interstitial but growing centripetally produce the greatest changes because the excessive increase in pelvic circulation and congestion are produced by the constant attempt of such a uterus to empty itself.

RALPH A. REIS.

M. Tapie: Contribution on the Histologic Diagnosis of Krukenberg Tumors, Arch. Franco-Belges de Chir. **20:** 105, 1927.

The author reports macroscopic and microscopic studies of three cases of bilateral ovarian carcinoma associated with gastric malignancy. Microscopic examination of the first two cases showed the "sarcoma ovarii muco-cellulare" of Krukenberg. Tapie calls attention to the fact that closely allied to the epithelial cells could be seen elongated elements resembling connective tissue cells, which he believes were formed by metaplasia of the epithelial cells. These ovarian tumors he calls true Krukenberg tumors having been formed by metastasis from the primary gastric malignancy. In the third case, however, the cylindrical type of epithelium was markedly accentuated; these cells with hyperchromatic nuclei surround the central gland-like cavity in two or more layers. In this case the author believes he was dealing not with true Krukenberg tumors but with secondary carcinomatous degeneration of bilateral ovarian cysts existing coincidently with a pyloric carcinoma.

THEODORE W. ADAMS.

Matschan: Echinococcus Cysts of The Broad Ligament, Arch. f. Gynäk. **131:** 588, 1928.

Matschan reports the tenth case of echinococcus cyst of the broad ligament on record. The patient had had two cysts, a mother and a daughter cyst, removed from the left broad ligament and six years later a third cyst was found in the right broad ligament. The author believes that this third cyst was undoubtedly present when the first two were removed but that it was probably so small that it was overlooked at operation.

RALPH A. REIS.

Gosagesco, A.: Cysts of the Ovary After Hysterectomy for Fibroids, Rev. franç. de gynéc. et d'obst. **24:** 428, 1929.

The development of small cysts in the ovaries after hysterectomy for fibroids and for inflammatory conditions is well known. The author deals in particular with the cases where the ovaries are intentionally left after hysterectomy to avoid menopausal symptoms and which terminate in large mucous cysts. This occurrence is not frequent but the author is able to report two such cases of his own and quotes two presented by Marinesco. In a series of 16 patients reexamined four to twenty-one months after hysteromyomectomy with preservation of the ovaries, Juvara, Dimuitriu and Gadei found cysts of the ovary twice.

These authors believe that ovarian cysts are found more frequently after hysterectomy than in normal women. In the entire series of 74 operations for fibroids of the uterus, ovarian cysts were found by these authors at the time of operation in twelve cases and two additional patients had had ovarian cysts removed previously. If to these 14 cases are added the two in which ovarian cysts subsequently developed, there was an incidence of 19 per cent for the association of fibroids and ovarian cysts. Hence the idea of retaining the ovaries when performing a hysterectomy does not appeal to Gosagesco.

J. P. GREENHILL.

Suresh Chandra Das Gupta: Notes on Ovariotomy, Medical Review of Reviews 3: 433, 1928.

Ovariotomy is one of the simplest and safest major operations in surgery. The sooner the operation is done the better the chances for recovery. Diagnosis of ovarian tumor is not always a very easy one. Differential diagnosis lies between obesity, pregnancy, ascites, tubal gestation, tumors of uterus, hydronephrosis, hydrosalpinx, pancreatic, omental and hydatid cysts, encapsulated tubercular peritonitis.

Menstruation as a rule is not affected, but often there exists menorrhagia or metrorrhagia. Amenorrhea is rare and occurs only when both ovaries are extensively involved.

The author dislikes tapping. In cases of malignancy or suppuration, aspiration should never be done. Tapping, however, is imperative when there is danger of cardiac failure from pressure in order to relieve immediately the symptoms. If the aspiration is thick, it is probably from an ovarian tumor, especially if brownish or of dark color. If it is pure or degenerated blood, it means malignancy.

In opening the abdomen it is important to identify positively the peritoneum. Often the cyst wall is mistaken for peritoneum. When there are firm adhesions to intestines, colon, stomach or bladder, it is better to cut through cyst wall, leaving the adherent portion attached to the bowel, than to risk tearing the gut, or stripping off a good deal of peritoneal covering. If extensive degeneration or malignant growth is present, it is better to close the wound without attempting removal of the mass.

ADAIR-HALLOCK.

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